Kew. QK1 .B95 1914

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1914.

LONDON:
PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S
STATIONERY OFFICE
By JAS. TRUSCOTT AND SON, LTD., CANNON STREET, E.C.

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1914.

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THE SEPARATE NUMBERS OF THIS VOLUME WERE PUBLISHED ON THE FOLLOWING DATES:—

No. 1	... ...	February 23.
No. 2	... ...	March 30.
No. 3	... ...	May 1.
No. 4	... ...	June 10.
No. 5	... ...	July 15.
No. 6	... ...	August 22.
No. 7	... ...	September 25.
No. 8	... ...	October 29.
No. 9	... ...	December 4.
No. 10	... ...	December 31.

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ERRATA.

Page 24, line 6 from bottom, *for* **LXXXVI**. *read* **LXXVI**.

Page 24, line 5 from bottom *et seq.*, the numbers of the descriptions should read 751–760.

Page 49, **Ribes wollense**, see footnote on p. 382.

Page 205, line 6 from bottom, *for* **Conservatum** *read* **Conservatarum**.

Page 260, line 10 from top, *for* *Sporophore* *read* *Sporophorum*, *for* tenum *read* tenue, and *for* **adanatum** *read* adnatum.

Page 260, line 22 from top, *for* Orangem *read* **Orange m.**

Page 340, line 11 from top, *for* Triman *read* Trimen.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1] [1914

I.—THE WOOD-OIL TREES OF CHINA AND JAPAN.

W. Botting Hemsley.

The *Kew Bulletin*, 1906, pp. 119–121, contains a "Revision of the Synonymy of the Species of Aleurites," the main feature of which is the definition and separation of *A. Fordii*, Hemsl., from *A. cordata*, R. Br. This was followed by figures of *A. Fordii* in Hooker's Icones Plantarum, xxix., tt. 2801 and 2802, Dec., 1906. Previously the very distinct *A. Fordii* had been confused with *A. cordata*, and the writer assumed that there were only these two species concerned. The incomplete herbarium and museum specimens at Kew were easily classified in this manner, both as to those from China and from Japan. But the material from the latter country was very imperfect and included no ripe fruit. Now Mr. E. H. Wilson, in a most interesting and instructive illustrated article, bearing the above title in the Bulletin of the Imperial Institute, vol. xi (1913), pp. 441–461, maintains that there are three species, relying mainly on the fruit for distinctive characters. "In China," he states, "two distinct species of *Aleurites* (*A. montana*, Wils., and *A. Fordii*, Hemsl.), each occupying for the most part distinct geographical areas, yield the wood-oils of commerce. In Southern Japan a third species (*A. cordata*, R. Br.) occurs, but the oil does not figure as an article of export to Western countries. These three species from very early times have been almost hopelessly confused." "As will be shown later," he continues, "these three species possess very distinctive characteristics, especially in the fruit, yet in the absence of complete material it is easy to confuse them." He then proceeds to explain the differences he finds, but does not finish with differential diagnoses and complete descriptions. Indeed, apart from the fruit and seed, he gives no definite constant differences. Concerning the Japanese tree, which he considers the true *A. cordata*, R. Br., Wilson's knowledge is also derived from herbarium specimens and published descriptions and figures. His comparison may be abbreviated as follows:—

In general appearance the Japanese species is similar to

(5528.) Wt. 212–780. 1,125. 2/14. J. T. & S. G. 14.

A. montana, Wils., but the flowers are rather smaller and the leaves on the flowering branches are often three-lobed. The fruit is somewhat turbinate and trigonous, about 2·5 cm. long, wider than long, flattened and often depressed at the summit, slightly tapering to the pedicel with three slight longitudinal and several irregularly transverse ridges. The fleshy part of the fruit is thin, soft, and fibrous, and encloses 3–5 seeds, which are smooth, subglobose, and 1·5 cm. in diameter. The fruit is, therefore, much smaller and more fragile than those of the two Chinese species. The foregoing fairly reproduces Wilson's enumeration and description of his differential characters. Although not accepting Wilson's description of the fruit of the Japanese tree, I agree that the available evidence favours his view that the Japanese *A. cordata* is specifically distinct from his new Chinese species *A. montana*. In this connection I have re-examined all the old material at Kew, and have also examined the additions since 1906, with the result that I can discover no essential correlative differences in the leaves, inflorescences or flowers. The leaves of the flowering branches in both Japanese and Chinese specimens are mostly entire, but sometimes three-lobed or, more rarely, five-lobed. The form and degree of development of the petiolar and laminal glands of the leaves seem to be equally variable in both, and the glands may be either prominent or almost obsolete. Of the inflorescence and flowers (as to size) the Kew material is insufficient for satisfactory comparison; but the Chinese specimens include such as bear relatively large strictly terminal inflorescences, and such as bear a number of smaller inflorescences proceeding from the axils of the upper leaves.

With regard to the size of inflorescences and individual flowers, so much depends on the age of the tree and on local conditions that little importance can be attached to size apart from other characters.

The flowers from different sources present no differences beyond degree in size, pubescence, etc., certainly nothing obvious in shape or structure. I have examined flowers, partly male, partly female, of Oldham 504, Formosa; Morse 542, Lungchow; Oldham 632, Nagasaki; and Balansa 3288, Tonquin. All, except Oldham 632, are referable to *A. montana*, Wils., though I have something more to explain concerning Balansa's specimen.

The characteristics of the flowers of all the specimens are: Calyx spathaceous, entire or more or less deeply two- or three-lobed. Petals usually 5, but varying occasionally up to 8, spathulate, longitudinally striate, more or less hairy inside in the middle portion, longer than the stamens and styles. Stamens 10, in 2 series, the inner longer, filaments more or less hairy in the middle portion. Staminodia or lobes of the disk 5; linear in the male flowers and alternating with the outer stamens; in the female flowers linear, with a broad base. Ovary more or less hairy, three-celled; styles deeply bifid.

Coming to the fruit, so far as it is known, the three proposed species are easily distinguished. *A. Fordii* has a spheroid fruit

about 5 cm. in longitudinal measurement, with an even surface and a pointed summit. *A. montana* has a somewhat larger, more ovoid fruit, with a wrinkled surface, and *A. cordata*, as represented in the Kew Herbarium by a specimen collected by K. Watanabe and by the figure in Shirasawa's Icones, i. t. 56, has a depressed, spheroidal fruit about 3 cm. in diameter and almost globose seeds. Shirasawa's figure, it may be added, shows both entire and lobed leaves in the inflorescence.

Now, there is no disputing the fact of these differences between the fruits of *A. montana*, Wils., and *A. cordata*, as Wilson would restrict it. He seems very confident of the validity of his new species, and there may be more in it than I have succeeded in realising; but I think it possible that selection and cultivation may account for something. Balansa's apparently luxuriant specimen from Tonquin, referred to above, is remarkable in having a small, terminal inflorescence much overtopped by the larger, deeply three- to five-lobed leaves. The flowers are small but exhibit no tangible peculiarities and no real deviations in structure from the others examined.

It may be useful to reproduce here Mr. Wilson's revised synonymy in harmony with his new classification.

Aleurites montana, Wilson, comb. nov.

Dryandra oleifera, Lamk., Encycl. Méth. Bot. ii. 329 (quoad fruct.) (1786). *Vernicia montana*, Lour., Fl. Cochinch. 587 (1790). *Dryandra Vernicia*, Correa in Ann. Mus. Hist. Nat. Paris, viii. 69, t. 32, fig. 1 (1806). *Elaeococcus Vernicia*, A. Juss. ex Spreng. Syst. Veg. iii. 884 (1826); Steud., Nomencl. Bot. ed. 2, i. 545 (1840). *Aleurites Vernicia*, Hassk. in Flora, xxv. ii. Beibl. 40 (1842). *A. cordata*, Muell. Arg. in DC. Prodr. xv. ii. 724 (pro parte) (1866); Bretschneider, Early Res. Fl. China, 172 (1881); Hemsl. in Journ. Linn. Soc. xxvi. 433 (pro parte) (1894), et in Kew Bull. 1906, 120 (excl. specim. Japon.); Dunn, Rep. Bot. For. Dept. Hongk., 1905.

South-Eastern China: Province of Fokien southward to Tongking.

It is highly probable that *A. verniciflua*, Baillon (Hist. Pl. v. 116, figs. 170, 171 (1874)), belongs here, but the seed only is figured, and this might well represent that of *A. Fordii*, Hemsley.

A. Fordii, Hemsl., in Hook. Ic. Pl. xxix., tt. 2801, 2802 (1906), et in Kew Bull. 1906, 120; Bull. Imp. Inst. v. 134 (1907); Fairchild in U.S. Dept. Agric. Circ. No. 108, cumicon. (1913).

Elaeococca verrucosa, A. Juss. Euphorb. Gen. Tent. 38, t. 11, fig. 35 (quoad fruct. et semin.) (1824). *Dryandra oleifera*, Wall. Cat. No. 7958 (nomen nudum) (1828), non Lamk. *Aleurites cordata*, Hook f. Fl. Brit. Ind. v. 384 (1887), non R. Br.; Hemsl. in Journ. Linn. Soc. xxvi. 433 (excl. synon. et specim. e Hainan, e Hongkong partim) (1894); Diels in Engl. Bot. Jahrb. xxix. 430 (1900); A. Henry in Chemist and Druggist, May 31, 1902; Hosie, Rep. Prov. Ssuch'uan, 34 (China No. 5), 1904; Pampanini in Nuov. Giorn. Bot. Ital. n. ser., xvii. 410 (1910).

China: Central provinces from coast to near the borders of Eastern Thibet; also in the south-western province of Yunnan.

A. cordata, R. Br. Steud. ex Nomencl. Bot. 286 (1821); Muell. Arg. in DC. Prodr. xv. pt. ii. 724 (quoad specim. Japon.) (1866); Shirasawa, Icon. Ess. For. Jap. i. t. 56 (1900); Hayata in Journ. Coll. Sci. Tokyo, xx. art. 3, 55, Rev. Euphorb. Jap.) (quoad plant. Japon.) (1904); Hemsl. in Kew Bull. 1906, 120 (quoad specim. Japon.); Matsumura, Ind. Pl. Jap. ii. 300 (excl. synon. *Vernicia montana*) (1912).

Dryandra cordata, Thunberg Fl. Jap. 267, t. 27 (1784); Banks, Icon. Kaempfer, t. 23 (1791). *D. oleifera,* Lamk, Encycl. Méth. Bot. ii. 329 (excl. fruct.) (1786). *Elaeococca verrucosa,* A. Juss. Euphorb. Gen. Tent. 38, t. 11, fig. 35 (excl. fruct. et semin.) (1824); Sieb. & Zucc. in Abh. Akad. Muench., iv, pt. ii, 145 (Fl. Jap. Fam. Nat., i, 37) (1843). *E. cordata,* Bl., Bijdr. 618 (1825); Miq. in Ann. Mus. Lugd.-Bat. iii 127 (Prol. Fl. Jap., 291) (1867); Franch. & Savat., Enum. Pl. Jap. i. 425 (1875). *Elaeococcus verrucosus,* A. Juss. ex Spreng., Syst. Veg., iii. 884 (1826); Steud. Nomencl. Bot. ed. 2, i. 545 (1840). *Aleurites japonica,* Bl. ex Miq. in Ann. Mus. Bot. Lugd.-Bat. iv. 120 (quasi synon.) (1868). *Paulownia imperialis,* Chapm. in Analyst, xxxvii. 551 (1912), non Sieb. & Zucc.

Southern Japan: Hondo, various localities, ex Hayata, Franchet and Savatier; also cultivated.

II.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamenta V.

1653 **Polyalthia viridis,** *Craib* [Anonaceae-Unoneae]; *P. fragranti,* Benth. et Hook. f. et *P. Thorelii,* Finet et Gagnep., affinis, ab illa pedicellis longioribus gracilioribus, petalorum pilis simplicibus, ab hac petalis longioribus distat.

Arbor circiter 6-metralis (ex *Kerr*); ramuli juventute densius brevissime puberuli, cortice pallide brunneo vel rubro-brunneo lenticellato obtecti. *Folia* oblonga vel elliptico-oblonga, apice acute acuminata, basi truncato-cordata, 21–25 cm. longa, 8·2–9·7 cm. lata, subcoriacea, costa nervisque subtus sparsius pubescentibus exceptis glabra, nervis lateralibus utrinque circiter 18 supra conspicuis subtus cum costa prominentibus, nervulis uti reticulatione gracili pagina superiore conspicuis inferiore subconspicuis; petioli validi, fusci, vix 1 cm. longi. *Inflorescentia* ex axillis foliorum delapsorum orta, sessilis, e cymis laxe furcatis vel alternatim ramosis constituta, ad 6 cm. longa; pedicelli ad 2·5 cm. longi, breviter pubescentes, circiter 1 cm. infra apicem bracteola solitaria ad 3 mm. longa instructi. *Sepala* 3·5 mm. longa, 4 mm. lata, dorso breviter adpresse pubescentia. *Petala* viridia (ex *Kerr*), circiter 3 cm. longa et 4 mm. lata, glabra vel fere glabra. *Antherae* ∞, 1 mm. altae. *Carpella* 1 mm. alta, ovulis solitariis vel geminis.

Muang Hă, on edge of clearing, 600 m., *Kerr* 2923.

Popowia Mesnyi, *Craib*, comb. nov. *P. aberrans*, Pierre ex Finet et Gagnep. in Bull. Soc. Bot. Fr., Mem. 4, p. 109, vix *Polyalthia aberrans*, Maingay. *Unona Mesnyi*, Pierre Fl. For. Cochin., t. 17, pro parte.

Srirăcha. Nong Yaiboo, 24 m., *Mrs. D. J. Collins* 6; Bangkok, Palace Gardens, *Murton* 30.

In Maingay's plant the carpels are nearly glabrous and the receptacle has a convex top, whereas in the plants quoted above the carpels are densely adpressed pubescent and the receptacle has a flat top.

Melodorum oblongum, *Craib* [Anonaceae-Xylopieae]; ab affini *M. rubiginoso*, Hook. f. et Th., sepalis fructescentibus longioribus, carpellis brevius pedicellatis recedit.

Frutex scandens (ex *Kerr*); ramuli primo ferrugineo-pubescentes, mox parce pubescentes, cortice fusco-brunneo reticulato-striato lenticellato obtecti. *Folia* oblonga vel cuneato-oblonga, apice rotundata, emarginata vel costa excurrente apiculata, basi ex cuneatis ad rotundata, 4·5–20 cm. longa, 2–9 cm. lata, coriacea, supra costa impressa inferne parce pubescente excepta glabra, subtus costa nervisque lateralibus praecipue ferrugineo-piloso-pubescentia, sicco brunnea, nervis lateralibus utrinque 14–15 vel foliorum minorum 10 supra impressis subtus cum costa valde prominentibus, nervis transversis subtus prominulis, supra sub oculo armato arcte reticulata, margine recurvo, petiolo ad 1·2 cm. longo supra canaliculato suffulta. *Sepala* fructescentia elongato-deltoidea, acuta, 6 mm. longa, 3 mm. lata, dorso tenuiter adpresse pubescentia. *Petala* ignota. *Carpella* subglobosa, circiter 2·5 cm. diametro, ferrugineo-tomentella, stipite ad 1·4 cm. longo ferrugineo-tomentoso suffulta. *Semina* carpello quoque 3–4, brunnea, nitida, ad 1·8 cm. longa.

Chiengmai, Doi Sutep, in evergreen jungle, 1650 m., *Kerr* 1879.

Thea (Camellia) confusa, *Craib* [Ternstroemiaceae-Gordonieae]; a *T. Sasanqua*, Nois., foliis majoribus facile distinguenda.

Arbuscula circiter 7·5 m. alta; ramuli teretes, primo parce puberuli, mox glabri, cortice brunneo vel cinereo-brunneo reticulato-striato obtecti. *Folia* oblanceolata ad obovato-oblanceolata, apice acuminata, acutiuscula, basi cuneata, 6·5–13·5 cm. longa, 3–5·2 cm. lata, coriacea, costa supra pubescente excepta glabra, supra viridia, nervis lateralibus utrinque 6–8 intra marginem anastomosantibus supra subconspicuis vel leviter impressis subtus prominulis, margine recurvo inferne distanter, superne, acumine excepto, arctius denticulata, petiolo ad 7 mm. longo supra canaliculato parce pubescente suffulta. *Flores* terminales, gemini, albi, sicco 5·5 cm. diametro; alabastra 1·5 cm. alta, 8 mm. diametro; bracteae imbricatae, brunneae, dorso superne praecipue adpresse albo-pubescentes. *Petala* alba, apice emarginata, ad 3·2 cm. longa et 1·8 cm. lata. *Filamenta* libera, inferne complanata, exteriora circiter 1 cm. longa, antheris 2·5 mm. longis. *Pistillum* 1·2 cm. altum, ovario 4·5 mm. alto dense albo-hirsuto, stylo

trisulcato inferne parce piloso apice trifido. *Fructus* 2 cm. altus, valvis tribus apice 3 mm. crassis dorso parce adpresse pilosis; semina brunnea—*T. japonica*, forma, Hosseus in Bot. Centralbl., Beih., vol. xxviii. p. 413. *Camellia drupifera*, Craib in Kew Bull., 1911, p. 16, *non* Lour. *C.* sp., Craib, Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 18.

Chiengmai, Doi Sutep, in evergreen jungle, 1200–1650 m., *Kerr* 889, 1363, *Garrett* 100, *Hosseus* 180.

Lao name, Mieng pa (ex *Kerr*).

Thea (**Calpiandra**) **connata,** *Craib* [Ternstroemiaceae-Gordonieae]; a *T. lanceolata*, Pierre, foliis tenuioribus arctius serrulatis, filamentis staminum interiorum exteriorum tubo connatis, stylo ovario aequialto recedit.

Arbuscula circiter 6-metralis (ex *Kerr*); ramuli primo densius adpresse pubescentes, mox glabri, cinereo-corticati. *Folia* plerumque oblanceolata, apice obtuse acuminata, interdum retusiuscula, basi cuneata vel cuneato-rotundata, 4–7·7 cm. longa, 1·9–3 cm. lata, chartacea vel rigide chartacea, supra costa breviter pubescente excepta glabra, subtus costa parce longiuscule pilosa, pagina utraque sed inferiore pallidius viridia, nervis lateralibus utrinque 7–9 intra marginem anastomosantibus supra prominulis subtus prominentibus, nervis transversis supra subprominulis vel tantum conspicuis subtus subprominulis; petioli ad 7 mm. longi, supra canaliculati, plus minusve glabrescentes. *Flores* solitarii, axillares, bracteis ciliolatis. *Sepala* 9 mm. longa, 7 mm. lata, ciliolata. *Petala* alba (ex *Kerr*), obovata, apice rotundata, 1·2–1·3 cm. longa, 8 mm. lata. *Filamenta* exteriora in tubum 1·1 cm. altum basi petalis breviter adnatum apice antheras 10–12 gerentem connata; intra tubum stamina 3, ima basi tubi connata praetereaque 3–4 tubo apicem versus connata; antherae 1·5–2·5 mm. longae. *Pistillum* 4 mm. altum, ovario triloculari adpresse albo-piloso; stylus ovario aequilongus, inferne parce pilosus. *Fructus* 1·8 cm. diametro, inconspicue parcissime adpresse albo-pubescens, pericarpio circiter 0·5 mm. crasso.

Chiengmai, in evergreen jungle on Doi Sutep, 1500–1650 m., *Kerr* 1878, 2732.

Indigofera oblonga, *Craib* [Leguminosae-Galegeae]; ab *I. caloneura*, Kurz, foliis majoribus longius petiolatis, pedicellis fructiferis 4 mm. tantum longis recedit.

Suffrutex 1·5–1·8 m. altus (ex *Kerr*); ramuli primo densius crispatim pubescentes, plus minusve glabrescentes, angulosi. *Folia* omnia simplicia, oblonga vel elliptico-oblonga, apice parum retusa, apiculata, basi late rotundata, subcordata, ad 12·7 cm. longa et 6·3 cm. lata, rigide chartacea vel fere subcoriacea, pagina superiore glabra, inferiore costa nervisque lateralibus ferrugineo-pubescentia, ceterum albo-pubescentia, nervis lateralibus utrinque circiter 20 supra conspicuis subtus cum costa prominentibus, nervis transversis subtus prominulis, petiolo ad 1·8 cm. longo breviter crispatim albo-pubescente supra auguste canaliculato suffulta; stipulae subulatae, 5 mm. longae; stipellae circiter 2 mm. longae. *Racemi* fructiferi ad 14 cm. longi,

pedunculo communi petiolo breviore suffulti; pedicelli validi, 4 mm. longi. *Legumina* patula, ambitu subquadrangularia, ad 5 cm. longa, vix 4 mm. diametro, breviter brunneo-tomentella.

Between Wieng Pipao and Doi Săket, Doi Nang Keo, in mixed jungle, 840 m., *Kerr* 2524.

Trichosanthes Kerrii, *Craib* [Cucurbitaceae-Cucumerineae]; a *T. villosa*, Blume, cui affinis, foliis integris basi haud alte cordatis recedit.

Ramuli molliter plus minusve adpresse rufo-pubescentes, sulcati, ad fere 4 mm. diametro. *Folia* ovata, apice acute acuminata, basi late, haud alte, cordata, ad 14 cm. longa et 9·7 cm. lata, chartacea, supra pilis breviusculis basi tuberculatis subscabrida, subtus dense molliter villosa, nervis lateralibus utrinque 5 supra conspicuis vel subconspicuis subtus prominentibus, nervis transversis supra subobscuris subtus prominulis, petiolo ad 4 cm. longo ut ramulis molliter adpresse rufo-pubescente suffulta. *Pedicelli* ad 2·5 cm. longi. *Receptaculum* circiter 2 cm. longum, indumento ut ramuli pedicellique instructum. *Sepala* oblanceolata, acuta, 1·8 cm. longa, 4·5 mm. lata, tricostata, extra densius adpresse pubescentia, intus parcius adpresse pubescentia. *Petala* alba (ex *Kerr*), flabellata, fimbriata, circiter 1·5 cm. longa et lata, pagina utraque pubescentia.

Doi Wao, climbing on bushes in old clearing, 1050 m., *Kerr* 2454.

319 **Thladiantha siamensis,** *Craib* [Cucurbitaceae-Cucumerineae]; a *T. Henryi*, Hemsley, calycis lobis multo brevioribus facile distinguenda.

Ramuli ad 3·5 mm. diametro, striati, pubescentes; cirrhi validiusculi, superne ramosi, pubescentes. *Folia* simplicia, ovata, apice acute acuminata, basi alte cordata, sinu ad 3 cm. longo et 4 cm. lato, ad 17 cm. longa et 12·3 cm. lata, membranacea, nervis lateralibus utrinque 6 pagina utraque conspicuis, supra tenuiter pilosa, subtus costa nervis nervulisque pilosula, margine integra, ciliata, petiolo 7 cm. longo validiusculo pubescente suffulta. *Pedunculus* communis inflorescentiae masculae 9·5–14 cm. longus, ut ramuli petiolique pubescens; pedicelli 3–5 cm. longi. *Receptaculum* 6 mm. altum, 6 mm. diametro, sulcatum, adpresse pubescens. *Calycis* segmenta deltoidea, 3 mm. longa et lata. *Petala* ad 1·3 cm. longa et 6·5 mm. lata. *Stamina* 5, quorum 4 filamentis per paria vix ad medium connatis, filamentis 5 mm. longis basi squamatis, praetereaque squamae duae oblongae, receptaculi fauce insertae, 3 mm. longae, 2 mm. latae. *Ovarii* rudimentum deficiens.

Chiengmai, Doi Sutep, evergreen jungle, 660 m., *Kerr* 1171.

Vernonia Kerrii, *Craib* [Compositae-Vernonieae]; a *V. Helferi*, Hook. f., cui affinis, involucri bracteis brevioribus angustioribus distinguenda.

Caules 13–23 cm. alti, primo subadpresse hirsuti, saepe flexuosi, mox glabri, circiter 1·5 mm. diametro. *Folia* oblanceolata, oblongo-oblanceolata vel late oblanceolata, apice acuta, obtusa vel rarissime fere rotundata, basi cuneata vel late cuneata,

4–6 cm. longa, 1·1–2·3 cm. lata, rigide chartacea, supra costa tantum basin versus praecipue pilis paucis brevibus instructa, subtus pilis paucis brevibus costa nervisque instructa, margine apicem versus praecipue distanter pauciserrata, nervis lateralibus utrinque 8–10 cum nervis transversis pagina superiore fere subprominulis inferiore prominentibus; petiolus 0–3 mm. longus, pubescens. *Capitula* terminalia axillariaque, solitaria, fasciculata vel breviter racemosa, subsessilia vel breviter pedunculata. *Involucri* bracteae superne primo brunneo-pilosae, mox glabrae, mucronatae, exteriores breves, deltoideae, interiores lineari-oblongae, 7·5 mm. longae, 1·25 mm. latae. *Pappus* basi breviter connatus, biseriatus; ordo exterior 0·75 mm. longus, interior 6 mm. longus. *Corollae* tubus 6·5 mm. longus, lobis 2·25 mm. longis. *Antherae* basi sagittatae, vix 2·5 mm. longae. *Stylus* superne breviter pubescens. *Achaenia* vix matura, 3 mm. longa, sulcatula, pubescentia.

Mê Nan, Sop Ngao, rock crevices by river, 210 m., *Kerr* 2404.

Exacum sutapense, *Hosseus* in Engler Bot. Jahrb., vol. xl. Beibl. 93, p. 99. (nomen); id. in Bot. Centralbl. Beih., vol. xxviii. p. 426 (nomen); *Craib* in Kew Bull., 1911, p. 421 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 137 (nomen); ex *Craib* [Gentianaceae-Exaceae]; ab *E. pterantho,* Wall. ex Griseb., partibus omnibus minoribus, foliis breviter petiolatis distinguendum.

Herba 2·5–16 cm. alta, glabra, caule saepissime simplice angulato. *Folia* ex lanceolatis ad rotundata, apice brevissime subacute acuminata vel obtusa, basi cuneata vel late cuneata, ad 12 mm. longa et 8 mm. lata, trinervia, nervis subconspicuis, petiolis brevibus suffulta. *Sepala* acuminata, acuta, 3·5–4 mm. longa, 1·25 mm. lata, dorso medio ala 1 mm. alta ornata, glabra. *Corolla* viva caerulea, sicco lutea; tubus 4 mm. longus; lobi oblongi, acutiusculi, 6 mm. longi, 2·25 mm. lati. *Filamenta* 1·25 mm. longa, antheris vix 1·5 mm. longis. *Ovarium* 2 mm. altum, glabrum; stylus 3 mm. longus, glaber.

Chiengmai, Doi Sutep, in open grassy ground, 1650 m., *Hosseus* 194, *Kerr* 1499.

Trichodesma calcareum, *Craib* [Boraginaceae-Borageae]; a *T. khasiano,* C. B. Clarke, cui affine, alabastris brevioribus latioribus, calcyce sub anthesin breviore eiusque lobis fructescentibus latioribus distinguendum.

Caules 1·2–1·5 m. alti (ex *Kerr*), subhispide albo-pubescentes. *Folia* opposita, elliptica vel subrhombeo-elliptica, apice acute acuminata, basi attenuata, ad 28 cm. longa et 11·3 cm. lata, chartacea, supra scabrida, subtus molliuscule albo-pubescentia, nervis lateralibus utrinque 8–9 supra conspicuis subtus prominulis, nervis transversis subtus subprominulis, margine plerumque parum recurvo, petiolo ad 7 mm. longo suffulta. *Panicula* terminalis, pyramidata, circiter 24 cm. longa et 15 cm. diametro; bracteae lineares vel lineari-lanceolatae, ad 1 cm. longae; pedicelli graciles, ad 1·7 cm. longi; alabastra acuminata, ad 1·3 cm. longa. *Calycis* extra hispiduli sub anthesin tubus 6 mm. longus, lobi 4, basi 5 mm. lati, 8 mm. longi, circiter e medio

arcte reflexi; calycis fructiferi ad 2·7 cm. longi lobi recti. *Corollae* albae (ex *Kerr*) tubus circiter 8·5 mm. longus, intra infra antheras densius villosus; limbus arcte reflexus, circiter 2·3 cm. diametro; lobi caudato-acuminati, 1 cm. longi. *Antherae* dorso dense albo-villosae, longe acuminatae, 1 cm. (acumine incluso) longae, exsertae. *Ovarium* glabrum, 1·5 mm. altum; stylus 1·5 cm. longus, glaber.

Doi Chieng Dao, crevices of limestone rock, 900 m., *Kerr* 2856.

Argyreia Henryi, *Craib*, comb. nov. *Ipomoea Henryi*, Craib in Kew Bull., 1911, p. 423 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 140.

Chiengmai, Doi Sutep, 660–900 m., *Kerr* 1489, 2773.

Distr. Yunnan.

Kerr 2773, in fruit, shows that this is not an *Ipomoea* but an *Argyreia* near to *A. obtecta*, C. B. Clarke, from which it may be distinguished by the leaves being ultimately glabrous above and with few adpressed stiff hairs on the lower surface.

Peristrophe parviflora, *Craib* [Acanthaceae-Justicieae]; *P. montanae*, Nees, *P. tinctoriae*, Nees et *P. ferae*, C. B. Clarke habitu similis sed floribus parvis facile distinguenda.

Fruticulus gregarius, 1·2–1·5 m. altus (ex *Kerr*); caules primo pilis brevibus reflexis parce instructi, mox glabri vel fere glabri, sulcati. *Folia* lanceolata vel ovato-lanceolata, apice acuminata, acutiuscula, basi cuneata, ad 7·6 cm. longa et 2·8 cm. lata, chartacea, supra costa parce pubescente excepta glabra, subtus pilis rigidis brevibus parcius instructa, nervis lateralibus utrinque 4–6 supra obscuris vel subobscuris subtus prominulis, nervis transversis paucis tantum subtus conspicuis, petiolo ad 1·5 cm. longo suffulta. *Bracteae* duae, inaequales, 1·5–2 cm. longae, 5·5–7 mm. latae, virides, parce pubescentes, ciliatae; bracteolae deltoideae ad lanceolatas, acuminatae, acutae, 2 mm. longae, 0·75–1·25 mm. latae, ciliatae, hyalinae. *Calyx* 3 mm. longus, lobis lanceolatis acutis 0·5 mm. latis tubo subaequilongis. *Corolla* lilacina (ex *Kerr*), 1·45 cm. longa, extra breviter pubescens, tubo 9·5 mm. longo. *Stamina* 2, filamentis pilis paucis albis divaricatis rigidiusculis instructis. *Ovarium* ambitu oblongum, 1·5 mm. altum, glabrum; stylus 1·25 cm. longus, glaber.

Doi Wao, by stream, 660 m., *Kerr* 2445.

Rungia maculata, *Craib* [Acanthaceae-Justicieae]; a *R. Brandisii*, C. B. Clarke, bracteis haud marginatis distinguenda.

Caules herbacei, ad 1·5 mm. diametro, pilis deflexis breviusculis tecti. *Folia* oblanceolata, oblongo-oblanceolata vel oblongo-lanceolata, apice obtusa vel subacuta, basi cuneata, 2–7 cm. longa, 0·8–3 cm. lata, chartacea, supra variegata (ex *Kerr*), pagina utraque breviter parcius pubescentia, nervis lateralibus utrinque 5–6 cum costa supra conspicuis subtus prominulis, ciliolata, petiolo ad 7 mm. longo suffulta. *Spicae* et terminales et ramulos breves laterales terminates, 2–4·5 cm. longae, breviter pedunculatae; bracteae late oblanceolatae vel oblongo-oblanceolatae, acuminatae, acutae, 8 mm. longae, 2·5 mm. latae,

utrinque puberulae, pilis longiusculis ciliatae; bracteolae inaequales, 3–5·5 mm. longae, 0·5–1 mm. latae, ciliolatae. *Sepala* 4·5 mm. longa, 0·5 mm. lata, pubescentia. *Capsula* 6 mm. longa, pubescens; semina compressa, 1·75 mm. diametro, pallide brunnea, papillosa.

Prê, Hue Kamin, near stream, 240 m., *Kerr* 2348.

Rungia rivicola, *Craib* [Acanthaceae-Justicieae]; ab affini *R. apiculata,* Bedd., antheris basi albo-appendiculatis recedit.

Caules primo flexuosi, bifacialiter breviter pubescentes, ceterum fere glabri, mox glabri. *Folia* lanceolata vel ovato-lanceolata, utrinque acuminata, apice obtusa, 4·5–10 cm. longa, 1·5–3·7 cm. lata, chartacea, supra glabra, subtus mox fere glabra, nervis lateralibus utrinque 6–8 supra conspicuis vel subobscuris subtus prominulis, nervulis paucis subtus conspicuis; petioli foliorum oppositorum inaequales, 5–14 mm. longi, lateribus breviter crispatim pubescentes. *Spicae* et axillares et terminales, ad 3 cm. longae, breviter pedunculatae; bracteae parum inaequilaterales, obovatae vel obovato-ellipticae, acute acuminatae, 0·9–1 cm. longae, 4 mm. latae, costa prominula, nervis subconspicuis, utrinque puberulae, ciliolatae, margine hyalino vel saepius purpureo-suffuso; bracteolae forma bracteis similes, 6·5–9 mm. longae, 2–2·25 mm. latae, puberulae, ciliolatae, hyalinae. *Sepala* 5, lanceolata, superne attenuata, 7 mm. longa, 1 mm. lata, puberula, ciliata, hyalina. *Corolla* pallide viridis, labio purpureo-maculata (ex *Kerr*); tubus 7·5 mm. longus, labio infero 4·5 mm. longo quam supero paulo breviore. *Stamina* 2, labio inferiori subaequilonga. *Ovarium* 1·5 mm. altum, glabrum, stylo parce breviter adpresse pubescente.

Doi Wao, by stream, 720 m., *Kerr* 2443.

Aristolochia (Siphisia) grandis, *Craib* [Aristolochiaceae]; ab affini *A. Balansae,* Franchet, foliis majoribus subtus costa nervisque lateralibus adpresse pubescentibus, pedicellis longioribus recedit.

Caules alte volubili; ramuli setulis plus minusve adpressis parcius instructi, mox fere glabri, pallide brunneo-corticati. *Folia* elliptica vel late oblonga, apice obtusa, rarissime retusa, basi rotundata vel truncato-rotundata, 11–25 cm. longa, 7–15 cm. lata, coriaceo-chartacea, supra sicco viridia, glabra, subtus pallida, costa nervisque lateralibus adpresse pubescentia, nervulis pilosula, nervis lateralibus utrinque 7–8 intra marginem anastomosantibus cum costa supra conspicuis subtus valde prominentibus, nervis transversis supra conspicuis subtus prominentibus, petiolo 3·5–8·5 cm. longo primo tomentello mox puberulo suffulta. *Cymae* racemiformes, axillares, foliis multo breviores, pauciflorae, parce brunneo-pilosae; bracteae parvae, brunneo-tomentosae; pedicelli sub anthesin 7·5 cm. longi. *Receptaculum* ad 2 cm. longum, 2 mm. diametro, dense breviter pallide brunneo-pilosum. *Calyx* paulo infra medium refractus, circiter 4·5 cm. longus, extra breviter parce pubescens, extra albus, brunneo-venosus, intra luteus (ex *Kerr*); limbus paulo ampliatus, papillosus, brunneus (ex *Kerr*). *Fructus* 13 cm. longus, 3 cm. diametro, parce breviter pubescens.

Chiengmai, Doi Sutep, in evergreen jungle by a stream, 750–900 m., *Kerr* 2223, 2223A.

Sauropus bicolor, *Craib*, nom. nov. *S. rigidus*, Craib in Kew Bull., 1911, p. 457 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 183, *non* Thwaites.

Chiengmai, Doi Sutep, in deciduous jungle, 300–1560 m., *Kerr* 651, 1825.

Distr. Tenasserim, *Gallatly.*

III.—COLD STORAGE OF FRUIT AND VEGETABLES.

L. A. Boodle.

The storage of fruit is a matter of some commercial importance, and a thorough knowledge of the best conditions for keeping ripe or unripe fruit of different kinds will be of great value in relation to the conveyance of fruit to a distance, and for other purposes. The methods at present in use, including refrigeration, have made it possible to carry many kinds of fruit for long sea voyages. The partial spoiling of a cargo of fruit is, however, a not uncommon occurrence, and attention is therefore called to the possibility of effecting improvements in method. The finding of such improvements will be greatly helped by a good knowledge of the physiological processes going on in fruits at different stages of ripening and at different temperatures, and it appears that much still remains to be learnt on this subject.

A paper recently published* records a number of experiments on the respiration of fruits, made with the object of gaining fresh data, which might be useful in connection with fruit-storage. The paper also contains a summary of literature dealing with different matters relating to the process of respiration.

In the experiments described in this paper, the respiration of different fruits when kept in air, in nitrogen, and in hydrogen was measured, and the keeping power of fruits in these gases and in carbonic acid gas was also tested.

An experiment with ripe cherries† was carried on for about 60 hours at 30° C., and gave the following result. The average hourly production of carbonic acid reckoned in milligrammes (mg.) per hundred grammes (grm.) of cherries was 14·2 in air. 12·0 in nitrogen, and 11·3 in hydrogen. In this case the fruit was kept in a continuous current of the respective gases. Another experiment was differently arranged, the gases being left undisturbed, except for half-an-hour twice a day, when they were drawn through the vessels containing the fruit as in the first experiment. Here the amounts of carbonic acid given off are represented by the figures 12·2 in air, 9·9 in nitrogen, and 10·9

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* George R. Hill, Jr. Respiration of fruits and growing plant tissues in certain gases, with reference to ventilation and fruit storage. Bulletin 330, Cornell Univ., Agric. Exp. Stn. of the Coll. of Agric., Dept. of Plant Physiology, 1913, Ithaca, N.Y., published by the University.

† The fruit was sterilised by dipping in 95 per cent. alcohol, and was then dipped in sterilised water.

in hydrogen. It is seen that in these two experiments the production of carbonic acid in an atmosphere of nitrogen or hydrogen, *i.e.*, in the absence of oxygen, is not far behind that in air, or in other words anaerobic respiration is not much less than aerobic.

Experiments were made with two varieties of ripe grapes,* and gave the result that respiration was as active in nitrogen and hydrogen as in air, more so in fact in some cases. One of the experiments carried on for 114 hours at 30° C. gave 5·2 mg. of carbonic acid per hundred grammes of fruit per hour in air, 6·2 in nitrogen, and 7·3 in hydrogen. The other experiment (34 hours at 37° C.) gave 9·9 in air, 9·5 in nitrogen, and 10·2 in hydrogen.

The above experiments show that in ripe fruits at 30° C. anaerobic respiration may be as rapid as aerobic, or not much less so.

An experiment was also made with unripe fruit, and this showed a different behaviour. Green peaches, about half grown, gave off 13·4 mg. of carbonic acid per 100 grm. of fruit per hour in air, 6·4 in nitrogen, and 6·1 in hydrogen.† Here the anaerobic is only about half the aerobic respiration. The difference between this ratio and those in the previous experiments may be attributed to the presence of growing tissues in the unripe fruit.

Germinating wheat was chosen as another example of actively growing tissue, and gave a similar result to the green peaches in one case‡ namely, 12·8 mg. in air, 6·0 in nitrogen, and 6·5 in hydrogen. In a second experiment§ there was a much greater difference between the amount of carbonic acid produced in the presence and absence of oxygen, the values being 33·5 mg. in air, 7·8 in nitrogen, and 6·4 in hydrogen.‖

It appears then from the different experiments that ripe fruit differs from unripe fruit in its respiratory processes, respiration in the former being to a great extent independent of an external supply of oxygen, while in the latter about half the respiration is stopped in the absence of oxygen. This is regarded as indicating that respiration in ripe fruit is probably maintained for the most part by enzymes which work independently of oxygen, while in unripe fruit the respiration is partly of the same nature, but is as much due to processes dependent on the presence of

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* Sterilised in alcohol.

† The experiment was run for 90 hours at 30° C.; the peaches were not sterilised.

‡ The experiment lasted 81 hours at 25° C. Previous experiments have shown that in germinating wheat intramolecular (anaerobic) respiration is much less than normal respiration, and this appears to be generally the case in aerobic plants. There are exceptions, however, seedlings of the broad bean and the castor-oil plant having been found to respire equally with and without oxygen.

§ 83 hours at 25° C.

‖ In the first of these two experiments the seeds had been sterilised in alcohol, and in formalin in the second. Hence it appears that one of the sterilising agents must have penetrated a little too far and affected the living tissue. Either the alcohol-treatment retarded respiration, or the formalin increased it.

oxygen. The latter processes may be enzymatic, but it is probable that the direct metabolism of the protoplasm plays a considerable part in them.

A calculation has been made in order to give an idea of the volume of carbonic acid given off in these experiments. The amount produced per hour by 100 grammes of ripe grapes at 30° C. was 5·2 mg. This would measure about 2·9 cubic centimetres, and the grapes at this rate would give off a volume of carbonic acid equal to their own bulk in about 32·6 hours, while the cherries in the first experiment would produce a corresponding amount in 11·8 hours.*

Other experiments were made on the keeping quality of fruits in air and in other gases. In one case apples of one variety were placed in jars of air, nitrogen and hydrogen, and left for 13 days. In each jar some apples were fairly ripe, and others somewhat green. At the end of the experiment the apples in air were in very good condition,† while those in nitrogen and hydrogen had lost their red colour, and had turned brown, both their appearance and flavour being much as in half-baked apples. This effect in nitrogen and hydrogen was shown not to be due to micro-organisms, but to the anaerobic respiration of the fruit. This shows the necessity of aeration when apples are kept for a considerable time at the temperature of the experiment, which was 21° to 23° C.

Another experiment was made with peaches, and it was found that they became brownish and acquired a bad flavour in the absence of oxygen, and that the softening of hard, unripe specimens was greatly decreased in carbonic acid, and to a considerable extent in nitrogen and hydrogen, as compared with air.

In two experiments referred to above it was found that ripe cherries respired much more rapidly than ripe grapes in the ratio of 14·2 to 5·2‡. In view of the better keeping properties of grapes as compared with cherries, it is suggested that the rate of evolution of carbonic acid may be more or less proportional to the rate of spoiling of ripe fruit, and this may also be proportional to the enzyme content of the fruit, since the processes concerned are probably chiefly due to the action of enzymes.§ Hence, if the factors controlling the production of enzymes were sufficiently understood, additional means might perhaps be found for improving the keeping quality of fruit.

It is desirable that further experiments should be made, in the same manner as those referred to above, on the production of carbonic acid by various kinds of fruit at different temperatures much lower than 30° C. Definite and comprehensive information on respiration at rather low temperatures would no doubt be very useful in relation to cold storage.

Feeble respiration takes place at 0° C., and even at —2° to —4° C., and it continually increases as the temperature rises, until

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* These figures are obtained by reckoning the fruit as having a specific gravity of 1·097, this being the value obtained with a sample of grapes.

† Except two out of seven, which appeared to have developed brown rot.

‡ This was in both cases in a continuous current of air at 30° C.

§ As suggested by the fact that they are largely independent of oxygen.

injury from high temperature begins.* Within a few degrees above freezing point respiration is no doubt very slight, and it is owing to this fact that fruit can be kept for a considerable time in refrigerating chambers. Suitable temperatures for different purposes have been found by experience, but more precise knowledge of the behaviour of fruit at these temperatures is required.

A matter requiring special attention in the storage of fruit is aeration. Air should have as free access to the fruit as possible, and therefore large masses of fruit should not be closely crowded together. Good circulation of the air should also be kept up, and for this the current of cold air from the refrigerating machine may often be sufficient, but in some cases ventilating fans have been used. The amount of care necessary in the matter of aeration depends, of course, largely on the temperature chosen for the storage chamber, as well as on the kind and condition of the fruit.

In the case of the transport of peaches in America in refrigerator cars, injury to the fruit is stated to be common, and the injury has been found to be most frequent in the central part of the top tiers of boxes. Cold air† is led along the bottom of the car, and, though diffusion and circulation equalise the temperature to some extent, it may be assumed that the upper strata of air have a somewhat higher temperature than the lower, and therefore that the fruit in the upper boxes respire more actively than the rest. The explanation is therefore suggested‡ that the injury is "due to insufficient oxygen and to an accumulation of carbon dioxide within the paper wrappers in which peaches are so often shipped." The preventive would no doubt be more uniform cooling, with better aeration if necessary.

It must be remembered that active respiration means an appreciable evolution of heat by the respiring tissues. Hence, in the case of large masses of fruit, if this heat is not rapidly conducted away, the temperature of the fruit (and of the air adjoining it) will rise, whereby the respiration will be further increased, and so on. Such heating at "compound interest" will be liable to occur locally, wherever aeration is insufficient, and may continue until the local temperature is considerably higher than the general air temperature in the refrigerating chamber, and may lead to the loss of portions of the fruit.

Should the temperature in the cold storage chamber be allowed to rise until respiration is very active, it may be found that the refrigerating apparatus will be unable to reduce the temperature of the fruit again, and this has been experienced, *e.g.*, in shipments of bananas.§ The fruit then ripens rapidly and spoils.

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* Pfeffer, Physiology of Plants (Eng. ed.), vol. I., p. 561.

† From ice-bunkers.

‡ G. R. Hill, loc. cit. The injury had been described by a dealer as "ice-scald," but the peaches had probably not been in a temperature lower than 7° C. (45° F.). Whole car-loads of the fruit are occasionally spoilt.

§ When the refrigerating machine has been out of order for a time. Bananas are not kept at a very low temperature during ocean transport. About 7° C. (45° F.) is the temperature chosen in some cases.

The difficulties to be contended with in arranging for the cold storage of vegetables may be illustrated by the following case.

An insulated storage room of about 6000 cubic feet capacity was fitted with a refrigerating machine, which easily reduced the air in the room, when empty, to a temperature of 27° F. (—3° C.). A temperature of 35° F. (2° C.) was required, and it was expected that the arrangements would be satisfactory. A trial was then made as to storage. Six tons of vegetables* were put into the room, and the temperature started at 59° F. (15° C.), but the machine was only able to reduce this to 50° F. (10° C.) in 10 hours. The refrigerator was then stopped, and in 12 hours the temperature was 59° F., and after 15 hours more it stood at 66° F. (19° C.). The air, moreover, was found to be badly vitiated by carbonic acid. The final rise of temperature was due to the respiration of the vegetables† and not to conduction through the walls, since the outside temperature during the last 24 hours had not been higher than 52° F. (11° C.), having varied between this and 45° F. (7° C.).

In another trial the machine was started first, and the temperature was reduced to 38° F. Then two and a half tons of cabbage and spinach were put into the store. The temperature was raised by this to 48° F., and after an hour with the machine still running it rose to 49° F. After five hours' run it stood at 45° F., and refused to go lower.

In this case the free air in the storage-chamber was well circulated. The unsuccessful result indicates that the vegetables required to be less crowded, or to be cooled in small batches before being brought into the store. The air must have been a good deal entangled among the vegetables, so that convection currents in the interior of the mass in each box would be slow, and consequently the loss of heat‡ in this way was not rapid enough to out-balance the heating due to respiration. Had the vegetables been cooled before being placed in the store-room, their respiration and self-heating would have been slow, and the refrigerating arrangements might perhaps have been able to deal with them efficiently, though unable to cope with the combined task of cooling the substance of the vegetables, and also removing the heat generated by respiration at or near the starting temperature.§ The entanglement of air and consequent difficulty of cooling would probably be much greater in a box of spinach, for instance, than in a box of the same dimensions containing fair-sized rounded fruit such as apples or oranges.

It can be readily understood that the matter of cold storage of fruit and vegetables is not a simple one. The treatment required by different kinds of fruit or vegetables may vary considerably as

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* In boxes.

† The result in this trial was probably almost entirely due to ordinary respiration, though a small proportion may represent increased respiration of cut and bruised surfaces. A little bacterial action may possibly have begun, and contributed slightly to the rise in temperature.

‡ To the refrigerated air.

§ This refers to vegetables badly placed for cooling, not to those well exposed to the refrigerated air.

to spacing out, packing, aeration and temperature. Much information has been gained by practical experience, but further knowledge is required, so that any failure causing loss of produce may be attributed to its precise cause, and, if possible, prevented for the future.

In conclusion reference should be made to another important point in connection with the cold storage of vegetables and fruit, namely, the cost of the refrigerating plant and the running expenses. For although it may be quite possible to keep a chamber at a desired temperature when filled with vegetables or fruit, yet the outlay involved in connection with the packing and unpacking and the laying out of the material on shelves, in addition to the cost of running the special refrigerating plant, may be so great as to render the undertaking impossible from the commercial point of view.

IV.—DIAGNOSES AFRICANAE : LVI.

1471. **Diplotaxis inopinata,** *Sprague* [Cruciferae-Brassiceae]; affinis *D. erucoidi*, DC et *D. griquensi*, Sprague; ab illa floribus minoribus, siliqua juventute pilosa, ab hac inflorescentia longiore rhachi cauleque minus hispidis pilis omnibus retrorsis, siliquis tandem glabris differt.

Herba erecta, annua, circiter 30 cm. alta, radice ± verticali pauciramoso. *Caulis* retrorse hispidulus, superne pauciramosus ramis brevibus ascendentibus. *Folia radicalia* lyrata lobo terminali elliptico lateralibus utrinque 3–4 triangulari-ovatis vel oblongis, utrinque praecipue subtus densiuscule subadpresse pilosa, 4–5 cm. longa, 1·5–2 cm. lata; petioli usque ad 2 cm. longi. *Folia caulina* lobis lateralibus unijugatis vel bijugatis lobo terminali pro rata magno oblongo-elliptico, superiora lobo terminali subtriangulari acuto. *Racemi* sub fructu usque ad 25 cm. longi. *Flores* 2–3 in anthesi in eodem tempore, in toto vix 5 mm. longi; pedicelli 2–2·5 mm. longi, glabri (vel apice tantum pilis paucis retrorsis). *Sepala* erecta, aequilonga, 3·5 mm. longa, extra longiuscule crispule pilosa, apice hyalina, anterius et posterius oblongo-linearia, 0·7–0·8 mm. lata, lateralia lanceolata-oblonga, 1 mm. lata. *Petala* erecta, limbo ascendente, spathulata, 4·5 mm. longa, 1·2 mm. lata, limbo obovoideo 2·5 mm. longo in unguem angustato pinnatim venoso venis utrinque 3–4. *Filamenta* lateralia 2·5 mm., anteriora et posteriora 3 mm. longa; antherae 0·8–0·9 mm. longae, sagittatae. *Glandulae* laterales bilobae, 0·3 mm. latae, anterior et posterior minimae. *Ovarium* tetragonum, 2·7 mm. longum, 0·5 mm. crassum; stylus crassus, vix 0·5 mm. longus; stigma integrum, apice cavo minuto centrali. *Siliquae* 2–3·5 cm. longae, glabrae, stylo haud 1 mm. longo stigmate subintegro coronato; septum 1·5 mm. latum; valvae valde unicostatae, post dehiscentiam explanatae, 2·5–3 mm. latae. *Semina* plane regulariter biseriata, oblongo-ellipsoidea; cotyledones obdeltoidei, lateribus convexis, truncati, vix 1 mm. longi, ultra 1 mm. lati; radicula ultra 1 mm. longa.

Tropical Africa. British East Africa: Nairobi, 1800 m., very common on cultivated land, *W. J. Dowson* 3.

The only species of *Diplotaxis* hitherto recorded from Tropical Africa is *D. erucoides*, DC., a native of the Mediterranean region and the Orient, which occurs in Abyssinia, according to A. Richard (Tent. Fl. Abyss., vol. i, p. 24). *D. inopinata* bears a superficial resemblance to certain forms of *D. erucoides*, but exhibits greater affinity with *D. griquensis*, Sprague (n. comb.), a native of South Africa (*Brassica griquensis*, N. E. Brown in Kew Bull., 1894, p. 353). Both *D. inopinata* and *D. griquensis* have siliquas with a short cylindric beak, oblong-ellipsoid seeds arranged in two distinct and regular rows, and truncate cotyledons—a combination of characters that, according to Prantl (Nat. Pflanz., vol. iii. 2, pp. 175–176), is characteristic of the genus *Diplotaxis*.

1472. **Guizotia reptans**, *Hutchinson* [Compositae-Helianthoideae]; species caulibus procumbentibus e nodis radicantibus valde distincta.

Herba procumbens, caulibus e basi foliosis usque ad 7 cm. longis e nodis radicantibus crassis glabris vel fere glabris, radicibus subsimplicibus ad 6·5 cm. longis. *Folia* opposita, spathulato-oblanceolata, apice rotundata, basi in petiolum latum striatum attenuata, caulis apicem versus paulatim longiora, 1–3 cm. longa, 0·5–1·3 cm. lata, remote denticulata, ciliata, tenuiter chartacea, supra parce setuloso-pilosa, infra glabra; costa inferne latissima et longitudinaliter striata, superne multo angustiora; nervi laterales utrinque 4–5, arcuati, distincti sed haud prominentes. *Capitula* in caule quoque apicem versus axillaria solitaria, pedunculata, circiter 2·5 cm. expansa; pedunculus 0·5–1 cm. longus, robustus, parce setuloso-pilosus. *Involucri bracteae* liberae, paucae, tenuiter foliaceae, ovata-ellipticae ad oblongae, obtusae, usque ad 1 cm. longae et 3 mm. latae, longitudinaliter striatae, longe et patule ciliatae, utrinque glabrae. *Flores radii* 6–7, lutei; pappus in utroque sexu nullus; corollae tubus cylindricus, 2·5 mm. longus, glaber; limbus oblongo-oblanceolatus, ad 1·5 cm. longus et 0·8 mm. latus, apice trilobatus, multistriatus, glaber; stylus exsertus. *Flores disci* pauci; corollae tubus inferne cylindricus, 3 mm. longus, basin versus extra minute setulosus, superne subcampanulatus; lobi 5, lanceolati, subobtusi, 1·5 mm. longi; antherae 2·5 mm. longae. *Achaenia* oblonga, basi leviter constricta, 3 mm. longa, glabra.

Tropical Africa. British East Africa: Aberdare Mountains, 3000 m., *Battiscombe* 530.

1473. **Linociera Battiscombei**, *Hutchinson* [Oleaceae-Oleineae]; species foliis plerumque lanceolatis, floribus in axillis dense glomeratis valde distincta.

Arbor usque ad 12 m. alta; ramuli cortice pallide cinereo obtecti, prominenter lenticellati, juniores parce pubescentes. *Folia* lanceolata vel elliptico-lanceolata, utrinque obtusa, 4–9 cm. longa, 1·5–3·3 cm. lata, integra, coriacea, supra nitida, infra pallida, utrinque glabra, nervis lateralibus gracilibus utrinque

4–5 arcuatis a costa angulo 45° abeuntibus utrinque distinctis sed vix prominentibus; petioli 3–5 mm. longi, robusti, minime transverse rugosi, leviter puberuli. *Flores* axillares, glomerati, glomerulis circiter 10-floris; bracteae oblongo-ovatae, subacute acuminatae, 4 mm. longae, 2 mm. latae, coriaceae, extra pubescentes. *Calycis* segmenta 4, duo ovata, obtusa, 1·75 mm. lata, duo alterna lanceolata, subacuta, omnia coriacea, intra glabra, extra pubescentia. *Corollae* tubus 2 mm. longus, glaber; segmenta oblongo-linearia, apice obtusa et cucullata, circiter 7 mm. longa et 2·5 mm. lata, glabra, marginibus involutis. *Antherae* subsessiles, 1·75 mm. longae. *Ovarium* ovoideum 1·5 mm. longum, glabrum; stylus brevis, stigmate basi sagittato.

Tropical Africa. British East Africa: Nairobi forests, 1700 m., *Battiscombe* 517.

This is a very distinct species more or less distantly related to *L. congesta*, Baker, from the Cameroons and Gaboon, with which it agrees in its axillary glomerate flowers, but differs markedly in the shape of the leaves and larger flowers.

1474. **Xysmalobium Pearsonii,** *N. E. Brown* [Asclepiadaceae-Cynancheae]; affinis *X. winterbergensi*, N. E. Br., sed foliis longioribus minus crispatis, umbellis 4–5-floris et coronae lobis planis ecarinatis differt.

Herba 30–40 cm. alta, basi ramosa. *Caules* vel rami erecti, basi 3–5 mm. crassi, glabri vel unifariam puberuli. *Folia* petiolata, erecta vel adscendentia, glabra; petiolus 1·5–7 cm. longus; lamina 6–15 cm. longa, 3–6 mm. lata, linearia, utrinque acuta, marginibus scabris leviter undulatis. *Umbellae* sessiles vel inferiores pedunculatae, 4–5-florae. *Pedicelli* 1·2–1·5 cm. longi, minute puberuli. *Sepala* 4 mm. longa, 2 mm. lata, ovata, acuta, tenuiter puberula. *Corolla* fere ad basin 5-loba, glabra, virescens ut videtur; lobi patuli, 6–7 mm. longi, 3 3·5 mm. lati, oblongo-ovati, acuti, concavi. *Coronae* lobi columnae staminum aequilongi, erecti, 3·5–4 mm. longi, 2·5–2·8 mm. lati, oblongi, apice rotundati, emarginati, plani ecarinati.

South Africa. Little Namaqualand: on the Khamiesberg Plateau, 1500 m., *Pearson* 6560.

The corolla appears to have been greenish and the coronal lobes ochreous, with a broad median fuscous stripe.

1475. **Cynanchum Pearsonii,** *N. E. Brown* [Asclepiadaceae-Cynancheae]; affinis *C. Meyeri*, Schltr., sed foliis angustioribus lanceolatis, corollae lobis angustioribus et acutioribus, corona diversa et stylo apice exserto differt.

Frutex lignosus, ramosus, 1–1·3 m. altus. *Rami* late divaricati, subrecti vel leviter sursum curvati, nec recurvi, primum minutissime cano-tomentosi, demum subglabri, pallide brunneo-ochracei. *Folia* patula vel deflexa, breviter petiolata, carnosa; 0·6–1·5 cm. longa, 2·5–5 mm. lata, lanceolata vel oblongo-lanceolata, acuta, basi, rotundata vel cuneata, primum minutissime puberula, demum glabra. *Flores* minuti, ad apices axium simplicium vel bifurcatorum parvorum gradatim elongatorum breviter pedunculatorum et 3–8 mm. longorum dispositi, sub-

sessiles vel brevissime pedicellati. *Sepala* 1 mm. longa, lanceolata, acuta, minute peberula. *Corolla* 2·5 mm. diametro, glabra; tubus 0·5 mm. longus; lobi 1·5 mm. longi, lanceolati, acuti, adscendentes, apice patuli. *Corona* campanulata, ad medium 5-loba; lobi ovati, acuti, intra basin bicarinati. *Stylus* ad apicem obtuse conicus, antheris multo longior.

South Africa. Great Namaqualand: in sand and crevices in granite near hilltop north of Rotkuppe station, *Pearson* 4466.

1476. **Microloma rotkuppense,** *N. E. Brown* [Asclepiadaceae-Cynancheae]; affinis *M. Burchellii,* N. E. Br., sed ramis crassioribus et floribus duplo majoribus facile distinguitur.

Frutex compactus, ramosissimus, 30–60 cm. altus, subaphyllus. *Rami* 2–3 mm., crassi, glabri. *Folia* celeriter decidua, brevissime petiolata, 4–5 mm. longa, 1–1·3 mm. lata, lineari-oblonga, obtusa, basi rotundata vel subcordata, minutissime puberula. *Flores* fasciculati. *Pedicelli* 1 mm. longi, minute puberuli. *Sepala* 4 mm. longa, linearia, acuta, minute puberula. *Corolla* tubulosa, apice conico-acuta, haud dilatata, 5-angularis, extra minutissime puberula, intra superne glabra, inferne fasciculis quinque pilorum instructa; tubus 6 mm. longus; lobi 2 mm. longi, connivento-erecti, compresso-ovati, acuminati, concavi. *Corona* nulla. *Folliculi* solitarii (semper?), 3·5 cm. longi, fusiformi, acuminati, glabri. *Semina* 5–6 mm. longa, ovata, plano-convexa, rugosa, rubescentia.

South Africa Great Namaqualand: mountains near Rotkuppe, *Pearson* 4192, 4462.

1477. **Microloma viridiflorum,** *N. E. Brown* [Asclepiadaceae-Cynancheae]; affinis *M. Massoni,* Schltr., sed foliis longioribus, floribus subduplo longioribus et corolla apice rotundata nec truncata facile distinguitur.

Frutex circa 30 cm. altus, ramosus. *Rami* 1·5–2 mm. crassi, velutini. *Folia* brevissime petiolata, 5–8 mm. longa, oblonga vel deltoideo-oblonga, acuta vel obtusa et apiculata, velutina. *Flores* fasciculati. *Pedicelli* 1–2 mm. longi, velutini. *Sepala* tubo corollae aequilonga vel subduplo breviore, 2·5–4·5 mm. longa, lanceolata vel lineari-lanceolata, acuta, velutina. *Corolla* suberceolata, apice dilatata, obtuse rotundata, vix apiculata, 5-angularis, extra minutissime puberula, intra superne sparsissime puberula, inferne fasciculis quinque pilorum instructa, viridis; tubus 3·5–4 mm. longus; lobi 1·3 mm. longi, connivento-incurvi, compresso-cucullati, acuti, minute ciliati. *Corona* nulla.

South Africa. Great Namaqualand; sandy plains about 11 miles west of Aus, *Pearson* 4205.

1478. **Schoenoxiphium Basutorum,** *Turrill* [Cyperaceae-Caricoideae]; affinis *S. lanceo,* Kuken., sed foliis angustioribus, rhachillis masculis in spiculis unisexualibus longioribus distinguitur.

Culmus 4·7 dm. longus, gracilis, laevis. *Folia* angustissime linearia, apice acute attenuata, usque ad 2·5 dm. longa et 1 mm. lata, margine tenuiter scabrido excepto glabra. *Inflorescentia*

compacte paniculata, usque ad 3·5 cm. longa et 1·3 cm. lata. *Bracteae* inferiores foliosae, usque ad 6 cm. longae, vaginantes, superiores glumaceae, elliptico-ovatae, acuminatae, 7 mm. longae,.3 mm. latae. *Spiculae* propriae usque ad 1·8 cm. longae, partiales usque ad 1·1 cm. longae, interdum androgynae, interdum abortu ♀. *Rhachilla* mascula in spiculis bisexualibus omnino 1 cm. longa, parte inferiore complanata 4 mm. longa, 0·75 mm. lata, in spiculis unisexualibus linearis, complanata, 8·5 mm. longa, 0·75 mm. lata. *Glumae* ♂ oblongo-ellipticae, acutae, 4·5 mm. longae, 1.5 mm. latae. *Utriculi* (prophylla) cylindrici 6·5 mm. longi, 1·25 mm. diametro, ore obliquo hyalino. *Nux* cylindrica, 4 mm. alta, 1 mm. diametro, laevis; stylus cum ramis 6 mm. longus, ramis tribus 4·5 mm. longis.

South Africa. Basutoland: Plateau, Leribe Mount, *A. Dieterlen* 948.

1479. **Scleria Dieterlenii**, *Turrill* [Cyperaceae-Caricoideae]; *S. Dregeanae*, Kunth, affinis, sed inflorescentiis hispidis nucibus valde transverse verrucoso-muricatis recedit.

Rhizoma verticale, unituberiferum, gracile. *Culmi* erecti, usque ad 2·4 dm. alti, laeves, basi squamis brunneis obtecti. *Folia* linearia, apice acuta, usque ad 10 cm. longa et 2 mm. lata, fere glabra vel pilis hic illic instructa. *Inflorescentia* terminalis, spicata, circiter 3–4 cm. longa; rhachis hispida. *Spiculae* sessiles, 1–4 aggregatae, ambitu oblongo-lanceolatae, 5 mm. longae, 1·75 mm. latae. *Glumae* ovatae vel elliptico-ovatae, acutae vel leviter acuminatae, usque ad 4 mm. longae et 1·75 mm. latae, extra hispidae. *Stamina* 3, filamentis 4·5 mm. longis. *Discus* inconspicuus, tridentatus, 0·5 mm. altus. *Nux* obovoidea, distincte trigona, breviter stipitata, 1·5 mm. longa, 1 mm. diametro, valde transverse verrucoso-muricata.

South Africa. Basutoland: Plateau, Leribe Mount, *A. Dieterlen* 749.

1480. **Pentaschistis Basutorum**, *Stapf* [Gramineae]; affinis *P. juncifoliae*, Stapf, sed statura minore, foliorum laminis brevioribus pro rata rigidioribus in facie superiore (sulco) indumento densissimo e pilis longis tenuissimis constituto vestitis, paniculae ramis ramulisque laevibus, spiculis paulo tenuioribus distincta.

Gramen perenne, dense caespitosum; culmi erecti, 30–35 cm. alti, glabri, laeves, 2–4 nodi, pro maxima parte vaginis inclusi vel internodiis intermediis 2 vel 1 breviter exsertis. *Foliorum* vaginae perarctae, firmae, nervoso-striatae, glaberrimae, laevissimae, nitentes, infimae persistentes; ligulae linea transversa densissime sericeo-pilosa notatae; laminae admodum rigidae, erectae, filiformes, sectione transversa cylindricae, anguste canaliculatae, ad 15 cm. longae, dorso glaberrimae, laevissimae, in facie superiore a ligula densissime sericeo-pilosae, pilis longis inferne ad margines magis minusve exsertis superne in sulco inclusis. *Panicula* angusta, 5–10 cm. longa, erecta; rami uti axis laeves, ad axillas piloso-barbati, pro parte brevi indivisi, inaequales, tenuiter filiformes, inferiores ad 4 cm. longi; ramuli pedicellique subcapillares, laeves; pedicelli laterales breves.

Spiculae albidae, ima basi purpurascentes, 9 mm. longae. *Glumae* lanceolatae, a latere visae acute longiuscule acuminatae, hyalinae, glabrae, 1-nerves, in carina laeves. *Valvae* oblongae, ad aristae insertionem 3·5–4 mm. longae, undique laxe pilosae, tenuissime sub-9-nerves, lobis acutis 0·5 mm. longis, setis lateralibus 6–7 mm. longis, arista 1·3–1·4 cm. longa ad 3·5 mm. torta columniformi, callo brevi breviter piloso. *Paleae* apice 2-dentatae vel 2-mucronulatae, 4–5 mm. longae, subglabrae. *Antherae* 3·5 mm. longae, purpurascentes.

South Africa. Basutoland: in the Veld near Leribe, *A. Dieterlen* 222. Lingua Sesotha:—Molälaoa hlolo.

V.—GREEN MANURES.

An account, by Mr. W. M. van Helten, of experiments carried out in Java during the past four years with various plants as green manures, has recently been published in Buitenzorg as No. 1 of Mededeelingen uif den Cultuurtuin,* and has been sent to Kew by the Director of the Department of Agriculture at Buitenzorg.

Some fifty-three different species of plants have been experimented with in connection with their value as cover plants for the soil and as green manures, in order to mitigate the poverty of the soil brought about by clean-weeding and the denudation of the soil by rain.

Of the numerous plants tried, many were found unsatisfactory in some particular, but six of them are to be recommended as a result of the trials.

Particulars of these six plants have been translated from the Dutch and now follow.

The original paper is illustrated by excellent figures of the various cover crops growing on an extensive scale in Java.

Leucaena glauca, *Benth.*

(*Lamtoro, Peteh tjina, Kamlandingan.*)

This is one of the oldest manurial plants under trial; it has been used about six years in the gardens and it still gives great satisfaction. The Leucaena or Lamtoro can be used in different ways, the growth should be kept in check according to the plants cultivated. In young coffee plantations it should be kept down, but it may be grown higher underneath Hevea, Ficus, and Cocoanut palms. Lamtoro requires fairly good soil; it does not grow much more than six inches and looks very sickly in poor soil.

In West Java the growth is not as vigorous as it is in the East and in Middle-Java. Lamtoro may be planted from sea-level up to 3500 feet. It was noticed that seeds germinated better and grew more quickly, when they were sown at the end of the East-monsoon, than did those which were sown in the full rainy

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* Mededeelingen uit den Cultuurtuin, No. 1. De Resultaten, verkregen in den Cultuurtuin met verschillende groenbemesters, door W. M. van Helten, Buitenzorg, 1913. 0.60 fr. G. Kolff & Co., Batavia.

season. Lamtoro produces plenty of seed, but it soon loses its capacity for germination. One cannot count upon more than 50 per cent. germination after the seed has been kept for four or five months. The seed may be sown in lines as well as scattered in the plantation. In Coffee and Hevea plantations it is advisable to sow the seed at once in broad bands between the trees. The seed will germinate in about a week's time. As long as the soil remains uncovered, weeding about every three or four weeks will be needed. Pruning can be done at intervals of three or five months. The Leucaena is not much attacked by blight or fungi, and it will also grow fairly well in half shade. One of the faults of this plant is that the leaves do not last long; the fine leaflets decay after a few days and only the branches and leaf stems remain.

For this reason the Lamtoro is not very effective as a covering for the soil, and it does not protect the plants among which it may be growing against drought as well as does *Clitoria cajanifolia*, the next plant to be described.

Clitoria cajanifolia, *Barth.*

(Soend: Katjang tjepel of Kakatjangan.)

This plant grows best below 2000 feet and is one of the best for covering the soil; it is also much used to plant on terraces to prevent the soil from washing away. It lives long and stands cutting very well. In plantations, where it has been sown for three years, it does not seem to die away or lose its vitality. One great advantage of this plant is, that when it has been cut down, it spreads itself over the ground. The sowing is rather troublesome, as the seeds are very sticky and adhere to the fingers. The seed should be sown in lines, half a pod in each hole, and they should not be washed before sowing, because they do not germinate very well after washing. The quickest way in which a piece of ground may be covered is by sowing the seed in lines from six to twelve inches apart, after about four months the soil will be covered and the plants can then be cut over every four or five months.

Clitoria is recommended for planting in Hevea and Coffee Plantations. One great advantage of this plant is, that the leaves are tough and last a long time. If the leaves be cut in the dry season and laid round the Coffee plants and Hevea trees, they will last a long time and the plants will not suffer much from drought; the plants also frequently put out a crop of fresh leaves when they have been cut over.

Clitoria like Lamtoro does not suffer from insect pests or fungal diseases.

A further point in favour of this plant is that neither the leaves nor seeds are eaten by human beings or animals.

Tephrosia spp.

Three Tephrosias have been tried, namely, *Tephrosia candida*, *T. Hookeriana* var., *amoena* and *T. Vogelii.*

The great value of the Tephrosias apart from their other good qualities is that they do better in soil of poor quality than do Leucaena or Clitoria.

Tephrosia Hookeriana, *Wight & Arn.*, var. **amoena,** *Prain*, (often but wrongly called *T. purpurea*), has been grown in our Gardens for about seven years and has always given great satisfaction. It produces many leaves and may be cut two or three times, at intervals of five months, before it dies. The seed may be sown in lines or spread broadcast. If sown in lines they should be eighteen inches apart.

T. Hookeriana, var. *amoena*, produces many seeds, which will germinate even after they have been kept for a long time; 80 per cent. of seed, as much as a year and a half old, was found to germinate. The young plants will not stand much rain, and it often happens that a young plantation will die away after rain has fallen for a couple of days.

If the plants have reached a height of about a foot, however, they are not nearly so susceptible to damp off with excess of rain.

It has also been noticed that seed kept for two or three months under favourable conditions will germinate more quickly than freshly gathered seed. Seed germinates in a few days and the soil becomes entirely covered by the crop in about three months' time from sowing. During the first three months the plantations should be weeded once or twice.

This Tephrosia grows very well from 600 to 2000 feet above sea-level, and will also stand some shade. Plants partly in the shade were not quite so vigorous as plants in full sun. As long as the plant is young, it does not suffer from the stem disease "djamoer oepas."* This disease sometimes attacks the plants when the stems become more woody. It seems that this disease does not attack the plants to such an extent if each time they are pruned larger portions of the stems are left standing.

Tephrosia candida, *DC.*

This plant is even better than the former species for green manuring purposes, since its growth is more vigorous and the leaves are much larger and very hairy on the underside. The seed, which should be sown in lines a foot apart, germinates in about a week's time, and the soil should be covered by the crop in about three or four months. If the plants, when they have grown to a height of 18 ins. to 2 ft., be cut down to a height of 9 ins. above the level of the soil, they will become more spreading in habit and send out branches from the lower part of the stem. Later on they can be cut every three or four months. *T. candida* can withstand considerable drought and frequent pruning; it has many leaves, which last a long time and form a good covering to the soil. The plants also live for a long time, and up to the present have been found to be almost the best for use as green manure.

T. candida may be used in Coffee and Hevea plantations, and it is also a very suitable cover crop for ground that is rather poor in quality, or for fresh-cleared land. Plants of two years standing did not appear to have lost their vigour, and no sign of Corticium was to be found on them.

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* "Djamoer oepas" is a well recognised stem disease, caused by *Corticium salmonicolor*, B. (C. javanicum, *Zimm.*).

Tephrosia Vogelii, *Hook. f.*

This is a useful species, but not of so much value as the ones already mentioned.

Desmodium gyroides, *DC.*

(*Potang koedjang bodas*).

This plant is the most valuable of the many species of Desmodium known to us at present. It grows in bushy form and produces many leaves; it can also be cut to any height, and lives a long time. *D. gyroides* is to be found in the neighbourhood of Plaboean-ratoe, up to 2500 feet. It produces a quantity of seed, which is very small, and it is therefore advisable to sow it in lines. The seed will germinate in about a fortnight. One drawback to the use of this plant, however, is that often many of the young plants die shortly after they appear above the ground for some reason which has not yet been satisfactorily explained.

This Desmodium is considered to be a very good manurial plant for Coffee and Hevea plantations, since it produces numerous leaves, which form a fairly thick humus layer. It does not suffer from any disease; the only fault to be found with it is, that some of the plants, after being pruned a couple of times, may be attacked by *Corticium salmonicolor*. If the injured plants be removed immediately, however, there is no fear of any harm being done to the cultivated plants.

Indigofera Anil, *Linn.*

This plant is of a bushy habit. The seed is very small, and is sown in lines eighteen inches to two feet apart; it will germinate in about seven to nine days. When first the seedlings show above ground it is almost impossible to weed amongst them, but after a month to a month and a half the difference between plants and weeds becomes sufficiently distinct for the weeds to be identified. The plantation will be covered with a dense growth after three or four months, and the plants can be cut back after six or seven months.

The plant lives about two-and-a-half years.

Another Indigofera (*I. hirsuta*) has also been tried, but it does not live so long as *I. Anil*, and as it can only be cut once it has not proved as useful as that species.

VI.—DECADES KEWENSES

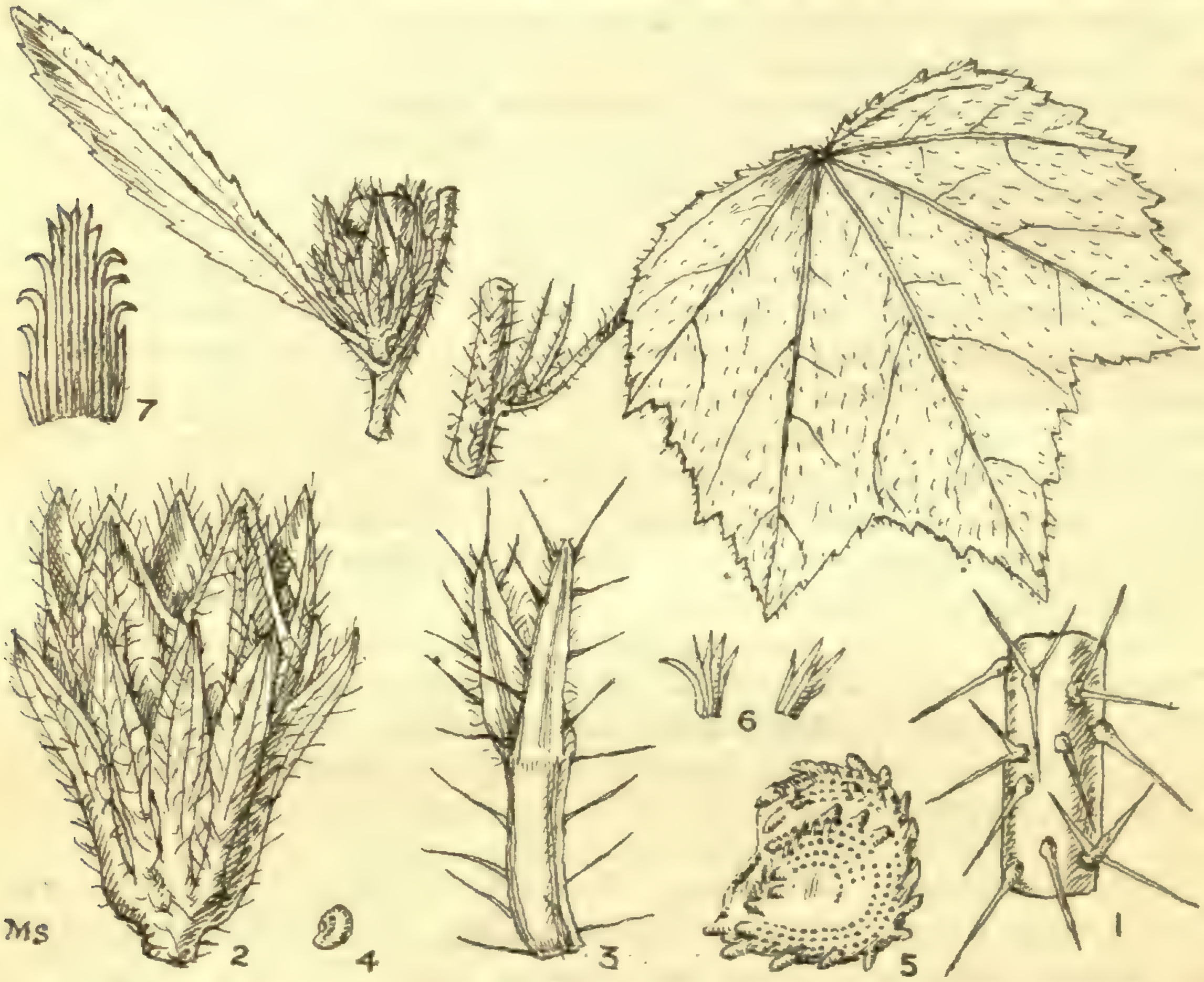
PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS LXXXVI.

741. **Hibiscus pachmarhicus,** *Haines* [Malvaceae-Hibisceae]; *H. furcato*, Roxb., *H. radiato*, Willd. et *H. Mastersiano*, Hiern, affinis; *H. Mastersiano* autem arctissime affinis; ab. *H. curcato* aculeis deficientibus, stipulis angustis, bracteolarum appendiculis minoribus pedunculis brevibus differt; ab *H. radiato*

aculeis nullis, foliis nunquam palmatifidis et margine minus serrato recedit; ab *H. Mastersiano* floribus majoribus, bracteolis appendicula minore instructis, calycis lobis longioribus angustioribusque (*H. Mastersiani* calycis lobi vix 9 mm. longi, acuti, non acuminati sunt), foliis serratis (in *H. Mastersiano* folia crenato-dentata sunt), setis stellatis numerosis differt.

Herba erecta, 0·6–1 m. alta, setis stellatis basi tuberculatis instructa, non aculeata. *Folia* submembranacea, inferiora rotundata vel ovata, 8–10 cm. diametro, superiora ovata vel lanceolata, summa lineari-oblonga, omnia impariter serrata pilisque stellatis pagina utraque tecta; petioli infimi circa 7 cm. longi, superiores breves; stipulae 1 cm. longae, lineari-setaceae.



1. *Part of stem.* 2. *Bracteoles and calyx.* 3. *Bracteole.*
4. *Seed—nat. size.* 5. *Seed—mag.* 6. *Small scale from seed.*
7. *Large scale from seed.*

Flores axillares, subsessiles, 4–5 cm. longi, flavi, in mediis purpurei. *Bracteolae* 10, ima basi inter se connatae, a calyce liberae, 1 cm. longae, setosae pilosaeque, lineares, appendiculatae, parte supra appendiculam lineari sub-terete obtusa appendiculae subaequilonga; appendicula bracteola parum latior, lanceolata. *Calyx* 1·2 cm. longus, 10-costatus, setosus pilosusque, lobis tubo longioribus lanceolatis acuminatis. *Capsula* ovoidea, rostrata, calycem longitudine subaequans, juventute pilis longis rigidis albis densissime instructa; semina acutangularia, verrucarum minutarum ordinibus squamisque ovatis pectinatis obducta.

India. Central Provinces: common in the middle Gondwana sandstones about Pachmarhi in the Satpura range, 900 m., *Haines* 197 P. Flowers and fruits October-November.

The scales on the seeds are very pretty objects under the microscope, much resembling scallop shells of which the ridges are produced into free ends.

H. Mastersianus was founded on Dr. Welwitsch's sheets Nos. 4927, 4928 and 5242. Hiern also doubtfully includes a tomentose form (sheet No. 5241), but states that the seeds of this are glabrous, smooth and shining, whereas the seeds of the others are slightly or sparingly papillose. Nothing is said of the scales in any of the forms. The writer has not attached so much importance to this difference, because it is found that both the scales and the papillae (or minute warts) are of late formation and occur in fertile seeds only.

Apart from this character, however, it would appear that the small-leaved, often tomentose, plants on sheets 4927 and 4928 are different species to that on sheet 5242 which comes nearer to *H. pachmarhicus*, although the flowers are only 1·9 cm. long. But the plant at Kew which most nearly approaches *H. pachmarhicus* appears to be F. A. Rogers, No. 7007 (Flora of N.W. Rhodesia), which is said to be "common all along the line." This has very scaly seeds and may be the same species. Mr. Sprague and Mr. Baker, who have kindly looked into the matter, both consider *H. pachmarhicus* distinct from *H. Mastersianus*, and Mr. Sprague, who has placed the sheet (No. 7007) referred to as near *H. Mastersianus*, informs me that the peculiar distribution entailed, if No. 7007 is really *H. pachmarhicus*, is not without parallel among other species of the genus (*e.g.*, *H. caesius*, Garcke).

Hochreutiner describes his "*H. surratensis*, var. *Mastersianus*" (to which he reduces *H. Mastersianus*, Hiern) as "aculeis minimis numerosis," but it seems to the writer that these are merely the stellate bristles of which only a single barb remains on the tubercled base, and that *H. Mastersianus* has no prickles comparable with those on *H. surratensis*.

742. **Crotalaria** (**Diffusae**) **Fysonii,** *Dunn* [Leguminosae-Genisteae]; *C. evolvuloidi*, Wight, affinis, floribus bis majoribus foliisque nunquam attenuatis distincta.

Herba perennis, diffusa, basi sublignosa. *Caules* multi, pauciramosi, ascendentes, 20–30 cm. longi, ut folia utrinque et pedunculi pedicelli calyces et legumina breviter molliter hirsuta. *Folia* simplicia, late ovata, apice rotundata vel rare breviter obtuse apiculata, basi oblique subcordata (1–) 1·3–1·8 (–3) cm. longa, brevissime petiolata, integra, subcoriacea, pilis in pagina superiore basi bulbosis, inferiore saepe stellatis, margine tomentosa, venis marginem approximantibus 3–4-jugis; stipulae lineares, persistentes, 1–2 mm. longae. *Racemi* terminales et foliis oppositi, pauciflori, 8–12 cm. longi, longe pedunculati. *Flores* 1·5–1·7 cm. longi, laete flavi, ante et post anthesin rubidi, pedicellis 5–7 mm. longis medio bibracteolatis, bracteis persistentibus 2 mm. longis. *Calyx* paullo bilabiatus, 1 cm. longus, lobis linearibus acutis tubo longioribus. *Corolla* lineata, calyce sesquilongior; vexilli lamina rotundata, reflexa, basi auriculis duabus inflexis instructa, ungue brevi; alae oblongae, in unguem brevem abrupte angustatae; petala carinae rostrata, antice anguste tomentosa. *Ovarium*

stipitatum, pubescens. *Legumen* cylindricum, 2·5–3 cm. longum, 6 mm. latum, calycem 3–4–plo excedens.

S. India. Madura Dist., Palni Hills, Kodaikanal Downs, flowering from May to September, *Fyson* 276, 1072, 1846; Travancore, Devicolam, 2130 m., *Meebold* 13,268; Mysore City, 915 m., *Meebold* 11,395.

743. **Lathyrus Sargentianus,** *Craib* [Leguminosae–Vicieae]; a *L. Wilsonii*, Craib, floribus minoribus facile distinguendus.

Caules volubiles, circiter unimetrales (ex *Wilson*), parce puberuli, plurisulcati. *Folia* fere sessilia, ad 15 cm. longa, rhachi supra canaliculata puberulaque in cirrhum ramosum producta; stipulae foliaceae, acutae, ad 15 mm. longae et 2·5 mm. latae, ciliolatae; foliola plerumque alterna, ad 7-juga, ovato-lanceolata, mucronata, basi late cuneata vel rotundato-cuneata, ad 4 cm. longa et 1·4 cm. lata, membranacea, supra pilis paucis instructa, subtus pallidiora, glabra nisi costa parce puberula, ciliolata, nervis lateralibus circiter 12 satis obliquis intra marginem anastomosantibus; petioluli 1–1·5 mm. longi, supra crispatim puberuli. *Racemi* axillares, pedunculo communi ad 6 cm. longo puberulo suffulti; bracteae persistentes, ad 7 mm. longae; pedicelli circiter 3 mm. longi; flores lutei (ex *Wilson*). *Calyx* 4 mm. longus, lobis 1·5 mm. longis. *Vexillum* 13·5 mm. longum, 6·5 mm. latum; alae 6·5 mm. longae, ungui 6·5 mm. longo, auricula brevi; carina 6 mm. longa, 3·5 mm. lata, ungui 6 mm. longo. *Legumen* ad 3·5 cm. longum et 9 mm. latum, stramineum, stipite circiter 5 mm. longo suffultum; semina 5 mm. longa, brunnea, fusco-maculosa.

China. Western Hupeh, *Wilson* 265 (1907); Fang, *Wilson* 1234 (1901). Western China, *Wilson* 3432 (1904).

744. **Lathyrus Wilsonii,** *Craib* [Leguminosae-Viciae]; a *L. Davidii*, Hance, foliolis stipulisque minoribus, floribus pauciori-bus recedit.

Caules volubiles, primo flexuosi, glabri, straminei, sulcati. *Folia* ad 6·5 cm. longa (petiolo cirrhoque exclusis), petiolo ad 1·5 cm. longo ut rhachi glabro supra late haud altius canali-culato, cirrho ramoso; stipulae erectae vel divaricatae, foliaceae, ad 1 cm. longae et 2·5 mm. latae, glabrae; foliola 3–4-juga, opposita vel rarius subopposita, oblongo-lanceolata, mucronata, basi cuneata, ad 5·7 cm. longa et 1·8 cm. lata, membranacea, glabra, subtus pallidiora vel fere glauca, nervis lateralibus utrinque circiter 5 obliquis intra marginem anastomosantibus. *Racemi* axillares, laxiflori, pedunculo communi ad 5·5 cm. longo terete glabro suffulti; bracteae deciduae; pedicelli 4 mm. longi. *Calycis* tubus latere inferiore 4 mm. longus, dentibus subulatis, inferiore 1·75 mm. longo lateralibus parum longiore, superioribus brevibus, margine minute rubro-glanduloso. *Vexillum* sub-oblongum, basi late cuneatum, apice emarginatum, 1·7 cm. longum, 8 mm. latum, sessile; alae oblongae, 7 mm. longae, 2·5 mm. latae, auricula obtusa 1 mm. longa, ungui 1·1 cm. longo; carina 8 mm. longa, 4 mm. lata, ungui 1 cm. longo. *Staminum* vaginae os rectum. *Ovarium* 9 mm. altum, stipite

3 mm. longo, stylo 5 mm. longo parum compresso facie inferiore pubescente.

China. Western Hupeh, *Wilson* 4595 (1910); Fang, *Wilson* 2095 (1901).

745. **Begonia** (**Gireoudia**?) **lophoptera,** *Rolfe* [Begoniaceae]; a *B. ciliata*, Oliv. (Bot. Mag. t. 5897) foliis et bracteis majoribus, floribus coccineis et capsulae alis piloso-cristatis differt.

Herba erecta, subelata (immatura circiter 30 cm. alta). *Caules* crassiusculi, pilosi. *Foliorum* petioli 3–12 cm. longi, hirsuto-villosi; laminae oblique suborbiculari-ovatae, 6–9 cm. longae, 5–10 cm. latae, obscure lobatae et crebre denticulatae, submembranaceae, supra nitidae, subtus glabrae, pallidae, nervis 5–7 radiantibus hirsutis vel pubescentibus; stipulae ovato-oblongae, denticulatae, 1·5–2·5 cm. longae. *Pedunculi* 6–8 cm. longi, suberecti, 8–12-flori, hirsuto-villosi, coccinei. *Flores* coccinei, extra hirsuto-villosi. *Flores* masculi: perianthii phylla 2, patentia, late elliptica, obtusa, 1–1·5 cm. longa; androecium globosum, 5 mm. longum; stamina brevissime monadelpha; antherae lineares, filamentis longiores, fissuris lateralibus. *Flores* feminei non visi. *Capsula* pendula, hirsuto-tuberculata, inaequaliter 3–alata; alae laterales late triangulares, subobtusae, 8 mm. longae, ala terminalis late oblonga, crassiuscula, 1·3 cm. longa, apice truncata et cristata; styli decidui.

Peru. Pozuzu, *R. Pearce* 556. Mayobamba district, *Forget*.

Originally discovered by Richard Pearce, who collected in the Andes for Messrs. James Veitch & Sons between 1862 and 1866, and afterwards introduced by L. Forget, who sent it to Messrs. Sander & Sons, in whose establishment at St. Albans it flowered in April, 1911. The flowers are of a vivid scarlet, and the upper wing of the fruit terminates in a remarkable thickened toothed and pilose crest, in allusion to which the name is given. In the absence of female flowers the affinity is somewhat doubtful.

746. **Mycetia Parishii,** *Craib* [Rubiaceae-Mussaendeae]; a *M. longifolia*, K.Sch., stipulis brevibus, foliis pagina utraque reticulatis, nervis lateralibus bene intra marginem anastomosantibus, sepalis integris, a *M. cauliflora*, Reinw., inter alia corollae lobis longioribus recedit.

Frutex altus (ex *Beddome*), ramulis primo densius puberulis mox glabris cortice brunneo plus minusve longitudinaliter reticulato-striato obtectis ad 4 mm. diametro. *Folia* saepe parum inaequilatera, lanceolata, ovato-lanceolata vel plerumque oblanceolata vel obovato-oblanceolata, apice acute acuminata, basi cuneata vel attenuato-cuneata, 10–21·5 cm. longa, 2–7·3 cm. lata, chartacea vel membranaceo-chartacea, pagina superiore glabra, inferiore costa nervisque puberula, nervis lateralibus utrinque 12-15 intra marginem anastomosantibus cum costa supra prominulis subtus valde prominentibus, nervis transversis supra conspicuis subtus prominentibus, nervulis uti reticulatione gracili subtus subprominulis; petioli usque ad 1 cm. longi, supra canaliculati, indumento ut ramuli; stipulae deltoideae, circiter 2 mm. longae et 2·5 mm. latae. *Inflorescentia* e cymis paniculatim dis-

positis composita, ad 5 cm. longa et 6 cm. diametro, pedunculo communi perbrevi vel usque ad 7 mm. longo suffulti, pedunculis rhachi pedicellisque puberulis; pedunculi partiales ad 1 cm. longi, ultimi 4–5 mm. longi; bracteae parvae. *Receptaculum* 2 mm. altum, glabrum. *Calycis* segmenta deltoidea, subacuta, 1·25 mm. longa, puberula. *Corollae* luteae (ex *Parish* et *Beddome*) tubus 1·3 cm. longus, intra parce albo-pilosus, lobi oblongi, ad 3·5 mm. longi et 1·25 mm. lati. *Stamina* corollae tubi ad basem inserta, filamentis brevibus, antheris 2 mm. longis. *Stylus* 1 cm. longus, pilis paucis instructus, ramis 4 mm. longis. *Fructus* 3·5–4 mm. diametro.

India. Lower Burma: Moulmein, *Parish* 1026; Papun, *Meebold* 17,029, 17,366; Tenasserim, Mooleyit, 900 m., *Beddome* 5.

After a careful examination of the specimens of this genus the writer is convinced that *Adenosacme longifolia*, Wall., var. *sinensis*, Hemsl., should be raised to specific rank under the name *Mycetia sinensis* and that it is necessary to restore Wallich's name for the Malay Peninsula plant *Adenosacme malayana*, Wall. = *Wendlandia malayana*, Don, thus becoming *Mycetia malayana*. It is necessary also to make the combination *Mycetia chasalioides* for *Adenosacme chasalioides*, Craib.

747. **Ixora Meeboldii,** *Craib* [Rubiaceae-Ixoreae]; ab *I. pendula*, Jack, inflorescentia longe pedunculata eiusque ramis brevibus recedit.

Suffrutex vix metralis (ex *Lobb*), inflorescentia excepta glaber, ramulis primo compressis mox teretibus 2–3 mm. diametro cortice primo stramineo mox cinereo-brunneo obtectis. *Folia* late oblanceolata vel fere oblongo-oblanceolata, apice acuminata, acuta, basi cuneata, 10·5–18 cm. longa, 3·5–6 cm. lata, chartacea vel rigide chartacea, nervis lateralibus utrinque circiter 8 pagina superiore conspicuis vel subprominulis inferiore cum costa prominentibus, nervis transversis pagina utraque prominulis vel subprominulis, margine parum recurvo, petiolo 0·5–1·2 cm. longo supra canaliculato suffulta; stipulae cuspidato-acuminatae, 3·5–6 mm. longae, dorso plus minusve carinatae. *Inflorescentia* corymbiformis, ad 4 cm. diametro, pedunculo communi 6–11 cm. longo basin versus bibracteato suffulta; bracteolae 1·5 mm. longae, dorso puberulae; flores albi (ex *Lobb*). *Receptaculum* 1 mm. altum, puberulum. *Calycis* segmenta deltoidea, acutiuscula, 0·75 mm. longa, ciliolata. dorso puberula. *Corollae* tubus 2·2 cm. longus, 0·75 mm. diametro, extra parcissime puberulus, intus glaber; lobi reflexi, 4 mm. longi, 2·75 lati, margine recurvo. *Filamenta* 0·75 mm. longa, antheris 2·5 mm. longis connectivo producto apiculatis. *Stylus* glaber. *Fructus* saepius monospermus, ad 8 mm. altus, 6–8 mm. diametro, sicco rubescens.

India. Lower Burma: Moulmein, 600 m., *Lobb*; Papun, *Meebold* 17,349. Martaban, *Wall. Cat* 8387 (*Psychotria?*).

var. **oblonga**, *Craib*, a typo foliis ad 25·5 cm. longis et 5·7 cm. latis oblongis vel elongato-oblongo-lanceolatis differt.

India. Lower Burma: Moulmein, Papun, *Meebold* 17,344, 17,345.

748. **Exacum Saulierei,** *Dunn* [Gentianaceae-Exaceae]; ab *E. zeylanico*, Roxb., calycis alis angustis et foliis 5–7 nervibus distincta.

Herba robusta, glabra, 1 m. alta, ramosa. *Caules* cylindrici, laeves. *Folia* opposita, sessilia, ovata, breviter acuminata vel acuta, palmatim 5–7–nervia; paria distantia. *Flores* speciosi, solitarii, axillares et terni, terminales; pedicelli 3–4 cm. longi, medio bracteolis 2 foliaceis 1–2 cm. longis muniti. *Calyx* 0·8–1 cm. longus; lobi 5, tubo aequales, acuminati, dorso carina crassa 1·5 mm. alta alati. *Corolla* expansa rotata, 5–6 cm. diametro, lobis lineari-oblongis 2·5 cm. longis apice rotundatis. *Stamina* 5, in fauce inserta, cum dentibus parvis alternantia; filamenta brevia; antherae erectae, 5–6 mm. longae, poris apicalibus dehiscentes. *Ovarium* ovoideum, subito acuminatum, biloculare; stylus stamina superans, deflexus.

India. Madras Presidency: Madura District, *Saulière* 69.

749. **Christisonia Saulierei,** *Dunn* [Orobanchaceae]; affinis *C. tubulosae*, Wight, floribus minoribus, pedicellis bracteas vix superantibus distincta.

Herba erecta, 30–40 cm. alta, parasitica, ubique praeter flores glaberrima. *Caules* simplices, 5 mm. crassi. *Folia* squamis paucis distantibus suboppositis oblongis 1 cm. longis substituta. *Racemi* pauciflori, breves, terminales; pedicelli erecti, 1–2 cm. longi; bracteae oblongae, 1–1·5 cm. longae. *Calycis* glabri tubus cylindricus, paullo bilabiatus, 1·5–1·7 cm. longus, 5–7 mm. latus, 5–lobatus; dentes 3 superiores 2 mm. longi, triangulares, acuti, sinubus 4 mm. altis a dentibus duobus inferioribus divisi. *Corolla* tubulosa, 3·5–4 cm. longa, 5 mm. lata vel paullo infra faucem inflata, extra tenuissime puberula, intra circum staminum insertionem tomentella; lobi 5, late ovati, 3–5 mm. longi, patuli, vel paullo reflexi. *Stamina* 4, didynamia, infra medium tubi inserta, inclusa; filamenta inferius pubescentia; antherarum loculi 2, inaequales, connectivo dependentes, basi caudati, majore ovato per totam longitudinem dehiscente, minore tenui sterili. *Ovarium* lanceolatum, paullo compressum, quasi 2–loculare, stylo incluso; stigma peltatum.

India. Madras Presidency: Madura District; Kodaikanal, 2040 m., *Saulière* 142.

750. **Betula Wilsonii,** *Bean* [Betulaceae]; species in genere ob folia plurinervia hirsutaque insignis.

Frutex, 1·5–3 metralis, ramis imis prostratis; ramuli hornotini pilis adscendentibus-appressis pallide fuscis dense induti, annotini glabri, parum verrucosi. *Folia* decidua, ovata, acuta, basi rotundata vel cuneata, margine irregulariter saepiusque bis serrata, 2–5·5 cm. longa, 1–2·5 cm. lata, supra viridia, hebetia, nisi secus nervos hirsutos glabrescentia, subtus praesertim secus costam nervosque pilis longiusculis sericeis fuscis induta; nervi utrinsecus 12–22, paralleli, supra manifeste impressi, subtus elevati; petiolus 2–3 mm. longus, sericeus; stipulae ovato-oblongae, 4 mm. longae, hirsutae. *Amenta maris* 1·3 cm. longa; squamae concavae, orbiculares, extra et in margine hirsutae, intus glabrae, atro-fuscae, nitentes. *Amenta feminea* 2 cm. longa;

squamae 3-lobae, 2·5 mm. longae, lobo centrali ovato-oblongo lateralibus rotundatis duplo vel plus quam duplo longiore ciliato.

China. Szechuan; Wushan; 2100—2700 m., *Wilson* 1140.

A very distinct dwarf birch, introduced to cultivation in 1909. In his field-note Wilson describes the plant as " 6 ft. to 10 ft. high, hanging down over cliffs: June and October, 1908."

VII.—MISCELLANEOUS NOTES.

Mr. Harry Barron Sharpe, formerly a member of the gardening staff of the Royal Botanic Gardens, has, we learn, been appointed Plant Import Inspector in the Agricultural Department, British East Africa.

Additions and alterations to Gardens, 1913.—Additions to the collections of plants cultivated at the Royal Botanic Gardens, Kew, have been made during the year by exchanges with other gardens, private as well as public, and by purchase from nurserymen and others. Contributions of plants and seeds received from Botanic Gardens and other institutions include the following:—

Brisbane—Orchids.
British East Africa—Native seeds.
Brussels Botanic Garden—Stove plants and Orchids.
Brussels Colonial Garden—Wardian case of Congo plants.
Buenos Aires—Collection of seeds.
Calcutta—Rhizomes of *Hedychium coronarium* for distribution; bulbs of *Lilium nepalense*.
Canadian Department of Agriculture—Seeds of *Zizania*, &c.
Ceylon—Rhizomes of *Hedychium coronarium* and *H. flavescens* for distribution.
Dominica—Various seeds.
Nigeria, Northern—Seeds of *Kerstingiella geocarpa* and *Voandzeia subterranea*.
St. Petersburg—Large plant of *Osmunda regalis* (see *Kew Bull.*, 1913, p. 359).
Saharanpur—Various seeds.
Saigon—Various seeds.
Singapore—Three Wardian cases of plants; palm and other seeds.
Sydney—Collection of native seeds.
Trinidad—Wardian case of plants; seeds.
United States Department of Agriculture—Collection of seedling Crotons; seeds.
Virgin Islands—Plants of *Mamillaria nivosa*.

Exchanges were made with the Botanic Gardens of Edinburgh, Glasnevin, Cambridge and Oxford, and with most of the European gardens upon which Kew is largely dependent for seeds of those annual herbaceous plants which fail to produce seeds at Kew.

Other donations to the Gardens include the following:—

Dr. Appleford, Hoddesdon—Plant of *Impatiens Jerdoniae*.

Mr. F. M. Bailey, C.M.G., Brisbane—Plants and seeds.

Mr. F. R. S. Balfour, Dawyck—Collection of British Columbian seeds.

Canon Ellacombe, Bitton—Plants and seeds.

Messrs. H. J. Elwes and W. R. Price—Plants and seeds from the Far East.

Lt.-Col. Sir E. Grogan, Bt., Santiago—"Yareta," fuel plant from the High Andes.

Messrs. Haage & Schmidt, Erfurt—Collection of seeds.

Lady Hanbury, La Mortola—Succulent plants; collection of seeds.

Dr. J. C. Harvey, Mexico—Plants of *Cypripedium Irapeanum;* seeds.

Lt.-Col. Sir G. Holford, Tetbury—Collection of Orchids (see *Kew Bull.*, 1913, p. 192.)

Rev. A. Miles Moss, Para—Brazilian Aristolochias.

Prof. H. H. W. Pearson, Cape Town—Bulbs and succulent plants.

Dr. G. V. Perez, Teneriffe—Seeds of Canary Island plants.

Mr. N. S. Pillans, Cape Colony—Succulent plants.

Mr. J. C. Quinn, Para—Seeds of *Manihot* spp.

Hon. N. C. Rothschild, Oundle—Collection of Bornean orchids.

Messrs. Sander & Sons, St. Albans—Large collection of stove plants; orchids.

Mrs. Sheppee, Bracknell—Collection of tropical orchids (see *Kew Bull.*, 1913, p. 359.)

Mr. C. M. Stuart, Kobe—Seeds of *Viscum album* var. *coloratum*.

Mrs. P. M. Sykes, Jersey—Seeds and bulbs collected in Persia.

Messrs. J. Veitch & Sons, Ltd.—Stove and greenhouse plants.

Mr. R. Whittle, Ascot, Queensland—Bulbs of *Eurycles amboinensis* and *E. Cunninghami*.

Miss Willmott, Great Warley—Collection of mossy saxifrages, &c.

Mr. O. O. Wrigley, Bury—72 Clivias in large pots.

Mr. P. H. Browne, Sutton, Mr. J. A. de Lastia, Panama, Mr. C. H. Lankester, Costa Rica, the late Sir Trevor Lawrence, Bt., Burford, Mr. A. C. Miles, Gold Coast, Mr. F. C. Ollenbach, Ootacamund, and Messrs. Stansfield & Hodgkin, Madagascar—Orchids.

Among the plants and seeds of interest distributed from Kew during the year were the following:—*Cytisus Dallimorei, Hedychium coronarium* (in quantity to Colonial Botanic Gardens), *Hedychium* species and hybrids (various), *Kerstingiella geocarpa* (seeds) and *Voandzeia subterranea* (seeds), *Nothofagus obliqua, Rhamnus Purshiana, Tillandsia reginae* (seeds), *Viscum album*, var. *coloratum* (seeds), and Chinese plants of recent introduction (various).

Wardian cases of plants were sent to Ceylon, Dominica, Hong Kong (2), Singapore (2), Uganda (2), and the Colonial Garden, Brussels.

Surplus trees, shrubs, and herbaceous plants were presented to public institutions.

There was a large demand for seeds ripened at Kew and offered for distribution in *Bulletin*, Appendix 1, 1913.

Among alterations and improvements carried out during the past year the following were the more important:—Continuation of re-making the Rock Garden. Re-roofing North Octagon of Temperate House. Re-arrangement of heating system of No. 1 House. The central portion of the Temperate House was re-painted inside, as also were a number of smaller houses.

Riverside Avenue.—The work of providing a new screen of evergreen vegetation to hide the unsightly parts of Brentford from the view of visitors in the north-west part of the gardens, which was begun last winter (see *K.B.* 1913, p. 51), is being completed. Owing to the number of large evergreens like holm oak, holly and yew that have been needed to make an immediately effective screen of sufficient height, the work has been of an arduous nature—some of the masses of earth moved with the trees weighing four to six tons. Once planted, however, the belt will be not only increasingly effective but permanent.

New Chinese Rhododendrons.—The large collection of rhododendrons raised from seeds of Wilson's gathering, and obtained also from Messrs. Veitch, J. C. Williams, Miss Willmott and other donors, having become too large for nursery quarters, it has become necessary to provide space for them in the Ericaceae collection. This is situated on the western side of King William's Temple. One of the "spurs" of the mound on which the temple stands has been cleared of a nondescript mixture of trees and shrubs for their accommodation. There is still the large collection raised from seeds sent home by Forrest to be disposed of during the next few years. It seems probable that before the whole of the Chinese rhododendrons and other new Ericaceae have been found permanent places, most of the ground in this part of the gardens will have to be given up to them.

Rose Dell.—The renewal of the roses in this pretty feature of the grounds, which was begun last winter, has been completed. About 350 of the best free-growing or rambling roses have been planted. The removal of a large sweet chestnut that stood in the middle of the dell has given more room for planting and will admit more light and air.

"Seven Sister" Elms.—The remnants of two more of these famous elms have had to be removed during the winter. The trees, once of very large size, had become reduced to mere fungus-eaten stumps a few feet high and dangerous to the public. There now remain three of the original seven, two of them lofty trees still vigorous, the other a stump with a propped-up limb on one side only. Judging by an engraving in the *Gardeners' Chronicle* of Sept. 15, 1883, from a drawing by Fitch, six of these elms were

then in good condition. They appear as good-sized trees in an old eighteenth-century engraving preserved in No. III. Museum, standing near the margin of George III.'s lake, which was filled up about 1814.

Additions to Arboretum.—The most important contribution to the hardy ligneous collections during 1913 has been made by the purchase from Messrs. Veitch of about 250 rare Chinese trees and shrubs collected by Wilson and Purdom. The impending dispersal of the collections at the Coombe Wood nursery made it imperative that Kew should acquire as many as possible of these before this lamentable but inevitable event happened. Many of the plants purchased were of species found by Wilson during his first journeys on behalf of Messrs. Veitch, which covered ground not since traversed by any collector. They have consequently not been again introduced, and some, not easy to propagate, are very rare in gardens. Many of the trees and shrubs are still under number, only the genus to which they belong being known. Among the more important ones obtained from Messrs Veitch are: *Cladrastis sinensis*, *Corylopsis sinensis*, *Actinidia Henryi*, *Eleutherococcus leucorrhizus*, *Diospyros armata*, *Meliosma Veitchiorum*, *M. Oldhamii*, *Pyrus Folgneri*, *Styrax Hemsleyanum*, *S. Veitchiorum*, and *Tsuga chinensis*. A tree of great interest is the true *Aesculus chinensis* of Bunge. Long known by name in European collections, this horse chestnut has not really been represented anywhere (except possibly by a single tree at Segrez, in France) until introduced by Purdom from North China. For many years the Japanese tree *A. turbinata* did duty for it on the continent, and latterly it has been confused with the tree found farther south, in Hupeh, by Wilson. The latter has recently been distinguished as *A. Wilsonii* by Rehder. Bunge's *A. chinensis* from North China was included in the purchases from Messrs. Veitch.

A very valuable consignment of trees and shrubs was received from the Arnold Arboretum in December. Besides Chinese species of Wilson's and Purdom's collecting, many interesting North American ones were included. Amongst the more important items were *Larix Potaninii*, *L. Mastersiana*, new American poplars, plums and cherries, oaks, hickories and Chinese willows.

As the result of an official visit made in June by the Assistant Curator to the nursery of Messrs. Leon Chenault & Son at Orleans, this firm kindly presented to Kew over seventy new and rare trees and shrubs noted at that time. Amongst them were species that have been introduced to cultivation by French missionaries in China from districts not traversed by English collectors. Mr. Maurice L. de Vilmorin has also sent contributions from his fine collections at Les Barres.

From the Royal Botanic Gardens, Glasnevin, were sent about 30 kinds of trees and shrubs noted by the Assistant Curator during an official visit to Ireland in February. Among them were two seedlings of *Daphne retusa*, one of the rarest and most beautiful of Daphnes. Mr. T. Smith's remarkable nursery at Newry was visited at the same time and purchases made.

The most important contribution of seeds to the Arboretum were 449 packets, gathered by Mr. G. Forrest in South China. Some seeds of interesting species in North-West America were presented by Mr. F. R. S. Balfour of Dawyck.

Acknowledgments are due to Canon Ellacombe, Miss Willmott, the Hon. Vicary Gibbs, and other amateurs for their willingness to contribute what they can towards making the national Arboretum as complete as possible.

The following trees and shrubs have flowered in the Aboretum Department for the first time:—

Berberis brevipaniculata and *B. subcaulialata* (China).
Ceratostigma Willmottiana (China).
Cotoneaster turbinata (China).
Davidia involucrata (China).
Deutzia compacta (China).
Fatsia horrida (North-West America).
Jasminum Beesianum (China).
Meliosma cuneifolia (China).
Prunus microlepis var. *Smithii* (Japan).
Rhododendron nigro-punctatum (China).

Waterfowl.—The number of eggs laid during the past year has been greater perhaps than ever before, but a large proportion has proved to be infertile. Of the birds hatched out, however, the majority were reared.

As usual, the greatest success was obtained with Carolina ducks, of which 27 were reared, ducks being considerably in excess of drakes. Other ducks reared were as follows—cinnamon teal, 5; blue-winged teal, 1; Bahama pintails, 3; common pochards, 3, as well as hybrid yellow-bills and tufted ducks.

Four birds were reared as the result of a cross between a yellow-bill drake and a Chiloe wigeon. The hybrids are handsome birds, with marked resemblance to the Chiloe wigeon, though lacking a good deal of the brightness of colour of the wigeon. Another hybrid—a cross between a maned gander and a yellow-bill duck—was produced as last year. In this case the hybrid is a distinct duck of a pale grey colour.

For the first time in the history of the Gardens the black-necked swans succeeded in rearing their offspring, and a handsome pair of young birds was the result. Two other events were of particular interest, namely, the rearing of a family of four by the bar-headed geese, which were sent to the Gardens from India in 1903, and have never before attempted to breed, and the rearing of a white-fronted goose. The pair of white-fronted geese were purchased in 1901, and this year, for the first time, two eggs were laid, both of which were fertile, but only one of the young birds was successfully reared.

The Canadian, China and white geese all reared families.

Of other birds, the storks failed to hatch out their eggs, having been disturbed when nesting, and the Demoiselle cranes were again unsuccessful with their solitary egg. Several peafowl were also reared.

Among losses during the year should be recorded the carrying off of a Magellan goose, when setting on her nest of eggs, by the badger, which has a large earth in Queen's Cottage grounds, and the similar fate of the Muscovy duck, which had a nest near that of the goose. A bar-headed goose has also been lost, apparently from the same cause.

During the breeding season many of the ducks wander to the further parts of the Gardens, and sometimes stray beyond the boundaries, and get to the river. The chestnut-breasted teal and a pair of wandering tree-ducks were the most serious losses this year.

Several interesting birds have been added to the Kew Collection by presentation or by exchange during the past year, and we are indebted to Mr. W. H. St. Quintin, of Scampston Hall, Rillington, York, for a pair of American wigeon, and we also received three chestnut-breasted teal from him, in exchange for Kew-reared birds, to replace those lost in the summer. One chestnut-breasted teal, a pair of wandering tree-ducks, three Magellan geese, and a Muscovy duck from the Zoological Society of London, a pair of herons from the Right Hon. James Round, of Birch Hall, near Colchester. A pair of Brent geese and a peacock were presented by H.M. Office of Works. One pair of white-eyed ducks were received in exchange from Mr. G. Legge, Patshull House, Wolverhampton. A pair of magpie geese were received in exchange from Commander Oliver Backhouse, H.M.S. *Excellent*, Portsmouth, and two mandarin ducks from Sir Richard Graham, Netherby.

A presentation of a pair of peacocks and a pair of brown China geese was made to H.M.S. *Excellent*, Portsmouth, and of a pair of brown China and Canadian geese to the Fitzgerald Park, Cork, and of Carolina ducks to H.M. Office of Works for the ornamental water in St. James's Park.

A consignment of young penguins was very kindly sent by Dr. Peringuey from Cape Town for the Royal Botanic Gardens, but owing to the difficulty experienced in keeping the birds previously received within bounds, they have been left in charge of the Zoological Society, Regent's Park, London.

Official Visits.—During the past year the vote for travelling expenses has been utilised as follows:—

The Curator.—In connection with a visit to the Quinquennial Exhibition of the Royal Society of Agriculture and Botany of Ghent and to horticultural establishments in Belgium.

The Assistant Curator.—To visit the arboretum of the Marquis of Headfort, in process of formation, and other gardens in the East of Ireland, and in a visit to Mr. Allard's arboretum at Angers, and other private and nursery gardens in France.

Mr. Irving.—In visiting the Royal Botanic Gardens, Edinburgh, and horticultural establishments in the neighbourhood.

Mr. Taylor.—In visits to gardens in the south and south-west of Ireland.

The Keeper of the Herbarium.—For the purpose of attend-

ing the 200th Anniversary of the Foundation of the Imperial Botanic Garden of Peter the Great, at St. Petersburg, as the representative of the Royal Botanic Gardens, Kew (see *K.B.* 1913, p. 243).

Mr. R. A. Rolfe. Assistant in the Herbarium.—To visit the Quinquennial Exhibition at Ghent and the Brussels Herbarium.

Mr. J. Hutchinson, Assistant for Africa.—For the purpose of examining types of African plants in the Herbaria at Paris, Brussels, Berlin, &c.

Mr. A. D. Cotton, Assistant in the Herbarium.—To study the cryptogamic vegetation of Blakeney Point, Norfolk.

The Keeper of the Museums.—For the purpose of attending the meeting of the Museums' Association at Hull.

Mr. J. H. Holland, Assistant in the Museums.—In a visit to Truro in connection with forestry exhibits at the Bath and West and Southern Counties Show.

Mr. W. Dallimore, Assistant in the Museums.—For taking part in the excursion of the Royal Scottish Arboricultural Society to Switzerland to study Swiss forestry methods. Also for a visit to Cornwall to inspect various timbers offered for the Forestry Museum by Mr. Reginald Rogers, Falmouth, and to study the bulb industry of the Scilly Islands (see *K.B.* 1913, p. 171).

Museums.—Many interesting products have been added to the collections during the past year, the more important of which have already been recorded in the *Bulletin*.

All available duplicates have been distributed to various institutions, including the following:—Hartley Laboratories, Liverpool University; Royal Agricultural College, Cirencester; Botanic Garden, Oxford; Municipal Museums, Hull, etc.

An exhibit was prepared for the Forestry Section of the Bath and West and Southern Counties Show held at Truro.

As in past years the Museum Staff has been fully occupied in determining various products submitted by Scientific Institutions, Commercial Firms, etc., and in furnishing general information on their properties, uses, references to literature, etc.

The assistance of an additional Museum Preparer has greatly facilitated the preparation of material for Museum IV., and much progress has been made in developing this Museum. Two additional wall cases have been added during the year, and it is much to be desired that the remaining cases needed to complete the furnishing of the Museum may be provided at no distant date.

The work of generally improving the permanent collections has gone on steadily. In Museum No. I. the repolishing of the cases has been completed. The relabelling of the contents of this Museum has been continued.

Individual members of the staff attended the Bath and West and Southern Counties Show held at Truro, the meeting of the Museums Association at Hull, and the annual excursion of the Royal Scottish Arboricultural Society to Switzerland.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the *Bulletin*:—

The Resident Commissioner, Tulagi, British Solomon Islands.—Gum copal from *Agathis macrophylla* from the Island of Vanikoro.

Mr. R. Fox, Falmouth.—Section of trunk of *Sophora tetraptera*.

Lady Smyth, Ashton Court, Bristol.—Photographs of forest scenery on the Ashton Court Estate.

Mr. Campbell P. Ogilvie, Finsbury Circus, London.—Railway sleeper, wood for fencing and tanning extract of Quebracho Colorado (*Quebrachia Lorentzii*) from the Argentine.

United States Department of Agriculture, Washington, D.C.—Fruits of *Diospyros Lotus*, *Zizyphus sativa*, etc.

Director of Agriculture, Peradeniya, Ceylon.—Stems of *Hedychium coronarium*.

Superintendent, Royal Gunpowder and Small Arms Factory, Enfield Lock.—Sections of wood of *Salix fragilis*, *Alnus glutinosa*, and *Rhamnus Frangula*, together with samples of charcoal prepared from same.

Messrs. Ide & Christie, Mark Lane, London.—Paper made from bamboo, Tonkin.

Dr. F. D. Drewitt, Kensington.—Lobster pot from Cornwall made partially of the wood of Tamarisk.

Mr. H. St. George Gray, Taunton Castle, Somerset.—Sample of Alder wood from Roman site, Barrington, Somerset.

Messrs. Dalton and Young, Fenchurch Street, London.—Sample of Valonia (*Quercus Aegilops*) from Smyrna.

Mr. E. D. Merrill, Bureau of Science, Manila.—Fruit of *Strychnos Ignatii* from Samar.

Mr. E. A. Lee, Liphook, Hants.—Transverse section of wood of *Cedrus Libani*.

Mr. T. Carter, Manhead, near Exeter.—Well-marked section of wood of *Quercus Ilex*.

Mr. C. Wakely, East Anglia Institute of Agriculture.—Section of wood of *Koelreuteria paniculata*.

Mr. F. Evans, Southern Nigeria.—Fruits of *Cocos nucifera* collected in Panama.

Professor Dr. van Iterson, junr., Delft.—Fruits of *Pseudophoenix vinifera* from Haiti.

J. M. H.

Research in Jodrell Laboratory in 1913:—

[**Boodle, L. A.**]—The Root and Haustorium of *Buttonia natalensis*. (*Kew Bull.*, 1913, pp. 240-242, with two figs. in text.)

[**Massee, G.**]—Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: XIV. (*Kew Bull.*, 1913, pp. 195–199, with one plate.)

Massee, G.—A new Grass Parasite (*Cladochytrium graminis*, Büsgen). (*Kew Bull.*, 1913, pp. 205–207, with seven figs. in text; and *Journ. Board Agric.*, vol. XX., pp. 701–703, with one plate.)

Massee, G.—A Disease of *Narcissus* Bulbs. (*Kew Bull.*, 1913, pp. 307–309, with one plate.)

Massee, G.—Nematodes or Eelworms. (*Kew Bull.*, 1913, pp. 343–351, with one plate and four figs. in text.)

[**Massee, G.**]—Clover Sickness. (*Journ. Board Agric.*, vol. XIX., pp. 928–930, with one plate.)

[**Massee, G.**]—*Rhizoctonia* Diseases. (*Journ. Board Agric.*, vol. XX., pp. 416–419, with one plate.)

[**Massee, G.**]—Apple Leaf-Spot. (*Journ. Board Agric.*, vol. XX., pp. 513–515, with one plate.)

[**Massee, G.**]—The Lattice-Fungus. (*The Field*, 1913, p. 911, with one fig. in text.)

Massee, Miss Ivy.—The Sterilisation of Seed. (*Kew Bull.*, 1913, pp. 183–187, with two plates; and *Journ. Board Agric.*, vol. XX., pp. 796–801, with two plates.)

Mr. L. A. Boodle carried out some cultural experiments with gorse-seedlings, and examined some anatomical features in *Buttonia* sp., and several other plants.

Prof. F. O. Bower made a comparative study of Ferns of Blechnoid affinity.

Mr. C. O. Farquharson investigated a Cacao and Rubber disease.

Miss Ivy Massee made experiments on the sterilisation of seed, and was engaged in researches on the life-history of a species of *Ustilago*, and on a Water-Lily disease.

Prof. R. B. Thomson made an examination of specimens of *Pinus* spp. showing abnormal growth after injury.

Mr. W. C. Worsdell studied some abnormal specimens of plants in connection with his morphological work on Vegetable Teratology.

Pathology.—A very large amount of material has been submitted to Kew for investigation during the past year. A grass disease caused by *Cladochytrium graminis*, Büsgen, which proves destructive to lawns, appears to be much on the increase in this country. The disease is introduced with the seed.

The sterility of apparently sound seed wheat has been proved to be due, in many instances, to the presence of mycelium in the pericarp of the grain. This mycelium commences active growth when the grain germinates and destroys the seedling.

A soft rot of narcissus bulbs has unfortunately become very prevalent. The leaves are attacked first, the mycelium passing

down into the bulb-scales. The fungus parasite causing this injury is *Fusarium bulbigenum*, Cke. and Mass.

A bacterial heart-rot of celery appears to be on the increase, and has, in one instance, been traced to the use of lime. Manure having an acid reaction, as superphosphate, should be used.

Work is in progress for the purpose of determining which, amongst the legion of fungi now credited with causing diseases, are in reality primary causes of disease, and not merely factors in aggravating a disease originally due to some other cause.

Diseased material has been received from the Federated Malay States, Nigeria, Gold Coast, West Indies, and a serious disease of bananas from Fiji is at present under observation.

Additions to the Herbarium during 1913.—During the year about 20,000 specimens were received as donations or exchanges, as well as the Wallichian and Horsfield Herbaria, while about 7300 were purchased, and 5200 received on loan. The principal collections are enumerated below:—

Europe.—*Presented*: Iceland, by Miss L. S. Gibbs; the British Herbarium of John Tatham, by Prof. Silvanus Thompson; Britain, by the Rev. H. J. Riddelsdell; Flora Hungarica Exsiccata, Cent. i., by the Hungarian National Museum; Kryptogamia Exsiccata, by the K. K. Naturhistorisches Hofmuseum, Vienna; Gibraltar, by Major A. H. Wolley-Dod, R.A.; Eastern Atlantic Algae, by Prof. C. Sauvageau.

Purchased: Dr. A. von Hayek, Centaureae Exsiccatae Criticae, fasc. 1; H. Sydow, Mycotheca Germanica, fasc. 24; W. Brinkman, Westfälische Pilze, Liefr. 1-4; Fiori & Béguinot, Flora Italica Exsiccata, Cent. xvii.-xviii., and Xylotomotheca Italica.

North Africa and Orient.—*Presented*: Isle of Ormuz, Persian Gulf (Paul B. Popenoe), by Mr. F. W. Popenoe; Kashaf Rud, Persia, by Mrs. P. M. Sykes.

Purchased: F. Vester & Co., Palestine; — Haradjian (per Dr. J. Briquet), Northern Syria; M. Gandoger, Moroccan Algae; R. Maire, North African Fungi.

Northern Asia.—*Presented*: Kamtschatka, by the Imperial Botanic Garden of Peter the Great, St. Petersburg; Siberia, Mongolia and Chinese Turkestan (F. N. Meyer), by U.S. Dept. of Agriculture.

China and Japan.—*Presented*: China and Tibet (G. Forrest), by the Royal Botanic Garden, Edinburgh; Yung Chun, China, by Mr. H. F. Rankin; Formosa, by Dr. B. Hayata through Mr. W. R. Price.

Purchased: Père E. J. Taquet, Corea.

India.—*Presented*: The Wallichian Herbarium, by the Linnean Society; India, various localities, by the Royal Botanic Garden, Calcutta, Mr. J. S. Gamble, Mr. A. Meebold and Mr. J. Ramsay Drummond; Central Provinces, by Mr. H. H. Haines;

Madras, by Lady A. G. Bourne; Burma (W. Micholitz), by Messrs. Sander & Sons; Gunong Mengkuang Lebah and Gunong Kerbau, by Mr. H. C. Robinson; Kuala Lumpur (M. Hashim), by Mr. C. Hummel.

Purchased: Rev. A. Saulière, Madura District, Madras.

Malaya.—*Presented*: Siam, by Dr. A. F. G. Kerr and Mrs. D. J. Collins; Siam (Pră, formerly Luang, Vanprük), by Mr. W. F. Lloyd; Indo-China and Borneo, by Mr. E. D. Merrill; Philippine Islands, by Mr. E. D. Merrill and Mr. Oakes Ames; British North Borneo, by Miss L. S. Gibbs; Java, the Horsfield Herbarium, by the Linnean Society; Java (Dr. S. Koorders and others), by Dr. J. C. Koningsberger.

Polynesia.—*Presented*: Hawaii, by Mr. E. D. Merrill.

Tropical Africa.—*Presented*: Sierra Leone, by Mr. C. E. Lane-Poole; Gold Coast, by Mr. T. F. Chipp; Northern Nigeria, by Mr. T. Thornton; Northern Nigeria, by Dr. J. M. Dalziel; Southern Nigeria, by Mr. N. W. Thomas; Somaliland, by Dr. R. E. Drake-Brockman; British East Africa, by Mr. E. Battiscombe; Uganda, by Mr. J. D. Snowden; Uganda (R. Fyffe), by Mr. W. R. Rutter; Congo Region, by Prof. E. De Wildeman; Rhodesia, by Mr. H. Godfrey Mundy; Rhodesia (Dominican Sisters), by Dr. S. Schönland; *Ficus*, by the Königlicher Botanischer Garten, Dahlem, and Prof. E. De Wildeman; Percy Sladen Memorial Expedition (Prof. H. H. W. Pearson and others), by the Percy Sladen Memorial Trustees.

Purchased: G. Zenker, Cameroons; G. Scheffler, Uganda; Rev. F. A. Rogers, Rhodesia.

Mascarene Islands.—*Presented*: Madagascar (E. Perrier de la Bâthie), by Prof. H. Jumelle.

South Africa.—*Presented*: Great Namaqualand (Prof. H. H. W. Pearson and others), by the Percy Sladen Memorial Trustees; Giftberg (E. P. Phillips), by the South African Museum and the Percy Sladen Memorial Trustees; Orange Free State, Natal, etc. (Dr. Otto Kuntze), by the New York Botanical Gardens; Basutoland (M. and Mme. Dieterlen), by Prof. C. Flahault; Basutoland (E. P. Phillips and others), by the South African Museum.

Purchased: H. Rudatis, Natal.

North America.—*Presented*: Arctic America (Fram Expedition), by Prof. J. N. F. Wille; specimens of cultivated *Phaseoli*, by the United States Department of Agriculture.

Purchased: F. S. Collins, Phycotheca Boreali-Americana, fasc. 38.

Central America.—*Presented*: Mexico (C. R. Barnes and W. J. G. Land), by Prof. C. F. Millspaugh; Mexico (Frères G. Arsène and Nicholas), by H.S.H. Prince Roland Bonaparte.

Purchased: J. Héribaud, Mexico; A. Tonduz, Costa Rica.

West Indies.—*Presented*: Cuba, etc., by the New York Botanical Garden; Tobago, etc., by Mr. W. E. Broadway.

Purchased: Miguel Fuertes, San Domingo.

South America.—*Purchased*: J. Héribaud, Colombia; K. Fiebrig, Paraguay; E. H. Hassler, Paraguay and Brazil; Otto Buchtien, Herbarium Bolivianum, cent. ii, iii and iv.

General.—*Presented*: Abate G. Bresadola, Fungi.
Purchased: Dr. F. Petrak, Cirsiotheca, fasc. 1-12; H. Sydow, Fungi Exotici Exsiccati, fasc. 2, 3 and 4.

The most important accession during the year has been that of the Wallichian and Horsfield Herbaria, which were presented by the Linnean Society, and the cabinets to contain them obtained through the generosity of Sir Frank Crisp, Bart. An account of these collections has been published in the *Kew Bulletin*, 1913, pp. 255-263. Prof. Silvanus P. Thompson has presented the British Herbarium of his grandfather, Mr. John Tatham of Settle, Yorks. Other British plants have been presented by the Rev. H. J. Riddelsdell, collected by himself and others. Miss L. S. Gibbs has presented plants collected by her in Iceland and British North Borneo. Major A. H. Wolley-Dod has presented a set of the Gibraltar plants collected by him, which he has worked out at Kew during the year.

An extensive collection made in Northern Syria by Haradjian has been acquired through Dr. J. Briquet, and a set from Palestine has been purchased from Messrs. F. Vester and Co., of Jerusalem. Prof. C. Savageau has presented a collection of Eastern Atlantic specimens of *Cystoseira*, illustrating his comprehensive paper published in the *Bulletin de la Station biologique d'Arcachon*, vol. xiv (1912). Additional specimens collected in China and Tibet by Mr. G. Forrest have been presented by the Royal Botanic Garden, Edinburgh. Mr. Herbert C. Robinson has sent the collections made by him in the Malay Peninsula; that from Gunong Kerbau coming chiefly from an altitude of about 5500 ft. Dr. A. F. G. Kerr, who has been working out certain of his Siamese plants while on a visit to Kew, has continued to present specimens, and through his kind offices other specimens from Siam have been received from Mrs. D. J. Collins. Mr. Elmer D. Merrill has continued to send plants from the Philippine Islands, and has presented others from Indo-China, Borneo and Hawaii. A valuable set of Javan plants collected by Dr. S. Koorders and others has been presented by Dr. J. C. Koningsberger.

Interesting collections from the Abinsi and Mundu districts of Northern Nigeria have been received from Dr. J. M. Dalziel. Uganda plants from Entebbe have been received from Mr. R. Fyffe, and from Mubendi and Toro from Mr. J. D. Snowden. Over 1300 specimens have been received from the various expeditions made under the auspices of the Percy Sladen Memorial Trustees, including that to the Great Karasberg.

Prof. J. N. F. Wille presented a set of plants collected in Arctic America during the Fram Expedition, 1898-1902. An interesting collection from Kamtschatka was presented by the Imperial Botanic Garden of Peter the Great, St. Petersburg. Collections made in various West Indian islands by Dr. N. L.

Britton and others have been presented. A further instalment of K. Fiebrig's Paraguay plants from Alto-Parana has been purchased through Mr. P. Weber.

Presentations to the Library during 1913.—The Bentham Trustees have presented a copy of the scarce little work on agriculture by Pierre de Quiqueran, translated from Latin by F. Nimy de Claret, and published at Tournon in 1616. Its title is: *La nouvelle Agriculture, ou instruction generale pour ensementer toutes sortes d'Arbres fruictiers, avec l'usage et proprietz d'iceux. . . . avec divers traictez des couleurs et naturel des Animaux.* The original Latin edition was published in Paris in 1551, after Quiqueran's death.

The Trees of Great Britain and Ireland, by H. J. Elwes and A. Henry, has been completed during the year with the issue of the seventh volume and an index to the whole work. The first volume appeared in 1906, and, excepting the prefatory matter and the postscript, the volumes have been paged continuously, terminating at page 2022. Most of the plates, of which there are 412, are reproductions by the Autotype Company of London of very fine photographs of trees remarkable in the majority of instances for their magnificence. Two complete copies of this costly work, which will for all time be a treasury of knowledge dealing with the trees indigenous or cultivated in the British Isles, have been presented by the Bentham Trustees. They have also presented the volumes published during the year of about thirty periodicals, which are forwarded to Kew in exchange for *Hooker's Icones Plantarum.*

The *Comptes Rendus* of the Academy of Sciences, Paris, the previous issues of which had been received from Sir J. D. Hooker, has been continued as a presentation to the library by Lady Hooker; and most of the weekly issues of *Science* for 1913 have been contributed by Miss Alice Eastwood of the California Academy of Sciences.

The heirs of the late Dr. Th. Durand have presented a copy of the *Conspectus Florae Africae*, by Dr. Durand and Prof. Hans Schinz. So far as published, this work consists of vol. i. pt. 2, and vol. v.

The publications received from the Botanical Museum of the University of Zurich, through Prof. Hans Schinz, include a copy of Dr. Thellung's voluminous dissertation *La flore adventice de Montpellier*, *Beiträge zur Kenntnis der Schweizerflora*, xiii. and xiv., *Beiträge zur Kenntnis der Afrikanischen Flora*, xxv., and the paper by Dr. Schellenberg, Prof. Schinz and Dr. Thellung on the flora of Colombia and the West Indies, extracted from Fuhrmann & Mayor's *Voyage d'exploration scientifique en Colombie.*

Prof. R. Chodat has presented a number of papers prepared by various workers in the Institute of Botany of the University of Geneva, and a copy of his *Monographies d'Algues en culture pure*, which forms part of the *Matériaux pour la flore cryptogamique suisse.*

A seventh volume of Mr. W. Foster's work, *The English Factories in India*, dealing with the period 1642-45; *Colloquies on the Simples and Drugs of India*, by Garcia da Orta, translated by Sir Clements Markham from Count Ficalho's edition published in Lisbon in 1895; and *Notes on the Agricultural Conditions and Problems of the United Provinces*, by W. H. Moreland, have been received from the Secretary of State for India. Garcia da Orta's work was originally published in Portuguese at Goa in 1563, and this edition is now extremely rare. It is the third book issued from the Press in India.

The third volume of *Die palaeobotanische Literatur*, edited by W. J. Jongmans, and *Mededeelingen van 's Rijks Herbarium, Leiden*, Nos. 8–14, have been received from the Director of the Herbarium named.

Seven copies of Supplement IV. to the Index Kewensis, which was published on November 13, have been presented by the Delegates of the Clarendon Press, Oxford. This Supplement includes the names published during the years 1906 to 1910, together with others of earlier dates which were omitted from the original Index and the previous Supplements.

An addition of much usefulness is the fourth volume of the *Catalogue of the Books . . . . in the British Museum (Natural History)*, which now extends as far as Snyder. This, with two copies of the *Catalogue of the Plants collected by Mr. and Mrs. P. A. Talbot in the Oban District, South Nigeria*, prepared by A. B. Rendle, E. G. Baker, S. Moore and others, has been contributed to the library by the Trustees of the British Museum.

From Sir Frank Crisp, Bart., has been received a copy of *Les Plantes des montagnes et des rochers: leur acclimatation et leur culture dans les jardins*, by H. Correvon; from Mr. J. C. Williams, G. Forrest's *Field Notes*; from Col. D. Mills, H. van Heurck's *Prodrome de la Flore des Algues marines des Isles Anglo-Normandes*, etc.; from Mr. Clement Reid, *Illustrations of Fossil Plants*, prepared under the supervision of J. Lindley and W. Hutton, and published by the North of England Institute of Mining and Mechanical Engineers in 1877, and a copy of his little book on *Submerged Forests*.

Messrs. Scott, Greenwood and Co. have sent *Insecticides, fungicides and weedkillers*, by E. Bourcart, and the third edition of *A manual of Agricultural Chemistry*, by H. Ingle; Messrs. Longmans, Green & Co. and the authors have sent copies of *Planting in Uganda*, by E. Brown and H. H. Hunter; Messrs. Houghton Mifflin Company, volume ii, part 4 of *Trees and Shrubs*, edited by Prof. C. S. Sargent, who has presented the third part of *Plantae Wilsonianae*, of which he is also the editor; and the publishers, Messrs. F. Tempsky and G. Freytag, *Unsere Freiland-Nadelhölzer*, by Ernst Graf Silva Tarouca and others.

Sir William T. Thiselton-Dyer, K.C.M.G., has presented his notebook on Carnivorous Plants, including his studies of the glands of *Nepenthes*, which was prepared for Sir J. D. Hooker's address to the British Association at Belfast in 1874, and a volume of 28 pamphlets on Carnivorous Plants by various authors.

Among the other more important contributions to the library are: *Nova Guinea* (Résultats de l'Expédition Scientifique Néerlandaise à la Nouvelle-Guinée en 1912 et 1913 sous les auspices de A. Franssen-Herderschee), vol. xii. livraison 1, from the Maatschappij ter Bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën; *Les aspects de la végétation en Belgique*, by C. Bommer and J. Massart (*Les districts flandrien et campinien*, by J. Massart), from the Director of the State Botanic Garden, Brussels; *A Flora de Portugal* (Plantas vasculares), by A. X. P. Coutinho, from the Director, Royal Botanic Gardens, Kew; *Webbia*, vol. iv. part 1, from the editor, Prof. U. Martelli; several works on Algae, including *Liste des Algues du Siboga*, by Mrs. A. Weber van Bosse; *Agave in the West Indies*, by W. Trelease, from Mr. N. E. Brown; *Icones Plantarum Formosanarum*, by B. Hayata, fasc. 2, from the Director of the Bureau of Productive Industries, Formosa; the continuation of the *North American Flora*, from Dr. N. L. Britton; a complete set of the *Bulletin de la Société Dendrologique de France* (8 volumes), from Mr. W. J. Bean; a large collection of reports and pamphlets, mainly on forestry, from Mr. J. S. Gamble; *National Hardy Plant Society's Year-Book*, 1912 and 1913, from the Editor, Mr. A. J. Macself; *Transactions of the Society of Arts*, vols. xlviii. and l. pt. 2, and *Journal*, vols. ii. and iii., from the Secretary; *Arbejder fra den Botaniske Have i Köbenhavn*, including *Danish Fungi as represented in the Herbarium of E. Rostrup*, revised by J. Lind, from the Botanical Library of the University of Copenhagen; and a manuscript catalogue of the British Herbarium of John Tatham of Settle, from his grandson, Prof. Silvanus P. Thompson, who has, moreover, presented the Herbarium itself to the establishment.

The numerous publications of the Department of Agriculture in the Dutch East Indies and of the Agricultural Research Institute, Pusa, issued during the year, have been received from the respective directors of those establishments, and a selection of the publications of the United States Department of Agriculture, from the Secretary.

Other contributions to the library, made in most instances by their authors, will appear in the annual supplement to the catalogue which forms Appendix II. to the *Kew Bulletin*.

Hibiscus Arnottianus.—During the stay of H.M.S. *Blossom* at Oahu, Sandwich Islands, in May, 1826, a fruiting specimen of a *Hibiscus* was gathered, which Hooker and Arnott identified doubtfully with *H. Boryanus*, DC. (Bot. Beechey's Voyage, p. 79). Their remarks on it are as follows:—

"From the imperfect state of the specimen before us, we cannot affirm it positively to be the plant of De Candolle. The leaves are ovate, slightly coriaceous, three-nerved, perfectly smooth, and quite entire. The peduncles are short, scarcely an inch long, and very stout. The calyx five-toothed and split up one side by the swelling of the fruit, as in De Candolle's section

Manihot. The carpels are polyspermous and the seeds covered with fulvous hairs. Perhaps, then, this is a new species, and more closely allied to *H. rhombifolius*, Cav.; but we possess a plant in flower from Owhyhee, collected by Mr. Macrae in Byron's Bay, which seems to be the same as ours: this certainly belongs to the section *Cremontia* by the nature of its corolla, and has toothed leaves, as in *H. Boryanus*: the flowers are, however, red, not white, and the leaves are three-nerved, as in the specimen from Oahu."

H. Boryanus, DC., is a native of Réunion (Bourbon), and differs from both the Sandwich Islands plants mentioned by Hooker and Arnott in its involucral bracts, which are longer than the calyx (DC. Prodr., vol. i, p. 446). The Beechey Voyage plant, which has white flowers, has since received the name *H. Waimeae* var. *Hookeri*, Hochr. (Ann. Conserv. & Jard. Bot. Genève, vol. iv, p. 132); and the red-flowered plant collected by Macrae at Byron's Bay, Hawaii, is identical with *H. kokio*, Hillebrand.

Asa Gray pointed out in 1854 (Bot. U.S. Expl. Exped., vol. i. p. 177) that the two Sandwich Islands plants referred to *H. Boryanus* by Hooker and Arnott were distinct from that species, but he failed to recognise that they also differed from each other, and accordingly described them as a single new species, to which he gave the name *H. Arnottianus*. The characters of the two species are so intermingled in Gray's description that it agrees with neither: the long staminal column, for example, being a characteristic of *H. Waimeae* var. *Hookeri*, and the red flowers, of *H. kokio*. If the name *H. Arnottianus* is not to be relegated to synonymy, as being a source of confusion, it seems that it should be applied to *H. kokio*, since this was the species of which Gray had material before him when he first proposed the name. In 1837 Gray sent a specimen of this species, collected on Oahu by Diell, to Sir William Hooker, under the name *Hibiscus Arnottii*, Gray (he subsequently altered the name to *Arnottianus*).

Hillebrand, however, who was the first to distinguish the two Sandwich Islands species, applied the name *H. Arnottianus* to the one collected during Beechey's Voyage, *i.e.*, to *H. Waimeae*, var. *Hookeri*, Hochr., and described the red-flowered species as *H. kokio* (Fl. Hawaiian Isl., p. 48).

A. A. Heller followed Hillebrand in calling the Beechey Voyage plant *H. Arnottianus*, but considered that there was a second white-flowered species in the Sandwich Islands, which differed in having suborbicular, crenate leaves. This he proposed as a new species, *H. Waimeae* (Minnesota Bot. Studies, vol. i, p. 851).

Hochreutiner, on the other hand, applied the name *H. Arnottianus* to the plant collected by Diell, *i.e.*, to *H. kokio*. He considered that there was only one white-flowered species in the Sandwich Islands, and called it *H. Waimeae*, distinguishing a var. *Hookeri*, with entire leaves, founded on the Beechey plant, and a var. *Helleri*, with crenate leaves, based on Heller's own specimen (Ann. Conserv. & Jard. Bot. Genève, vol. iv, p. 132).

So much confusion has arisen in the past in connection with the name *H. Arnottianus* that it is perhaps desirable to abandon the use of it altogether. The three Sandwich Islands plants whose history has been given may be distinguished as follows:—

Flowers white; involucral bracts reflexed; staminal column much exserted; style-arms sub-erect ... ... *H. Waimeae.*
  Leaves broadly ovate, entire; calyx under 2 cm. long ... ... var. *Hookeri.*
  Leaves usually elliptic or suborbicular, crenate; calyx 2·5–3 cm. long ... var. *Helleri* (=typical *Waimeae*).

Flowers red; involucral bracts sub-erect; staminal column hardly as long as the petals (when these are extended); style-arms spreading ... ... *H. kokio.*

H. Waimeae, *A. A. Heller*, in Minnesota Bot. Studies, vol. i, p. 851: Sprague in Bot. Mag. t. 8547. *H. Waimeae*, var. *Helleri*, Hochreutiner in Ann. Conserv. & Jard. Bot. Genève, vol. iv, p. 132. *H. Arnottianus*, H. Mann in Proc. Amer. Acad., vol. vii. p. 157; Hillebr. Fl. Hawaiian Isl., p. 48, partly. *H. Arnottianus*, forma, Sinclair, Indig. Fl. Hawaiian Isl., t. 8.

Hawaiian Islands. Kauai: above Waimea, 900 m., *Heller* 2785. Oahu, *Mann & Brigham* 530. Hawaii, *Mrs. Sinclair.*

H. Waimeae, var **Hookeri,** *Hochreutiner* in Ann. Conserv. & Jard. Bot. Genève, vol. iv, p. 132. *H. Boryanus*, Hook & Arn. Bot. Beechey's Voy., p. 79, excluding Macrae's specimen, not of DC. *H. Arnottianus*, A. Gray, Bot. U.S. Expl. Exped., vol. i, p. 176, partly; Wawra in Flora, 1873, p. 173; Hillebr. Fl. Hawaiian Isl., p. 48, partly.

Hawaiian Islands. Oahu, *Lay & Collie; Hillebrand* 374.

H. kokio, *Hillebr. ex Wawra* in Flora, 1873, p. 174; Hillebr. Fl. Hawaiian Isl., p. 48. *H. Boryanus*, Hook & Arn. Bot. Beechey's Voy., p. 79, as to Macrae's specimen, not of DC. *H. Arnottianus*, A. Gray, Bot. U.S. Expl. Exped., vol. i, p. 176, partly; Hochr. in Ann. Conserv. & Jard. Bot. Genéve, vol. iv, p. 133, vars. *kokio* and *genuinus*. *H. Arnottianus*, forma, Sinclair, Indig. Fl. Hawaiian Isl. t. 9. *H. Remyi*, Hillebr. ex Hochr., l.c.

Hawaiian Islands. Oahu, *Diell* 57. Hawaii, *Macrae; Mrs. Sinclair.* Also in Kauai and Molokai, according to Hillebrand.

H. kahili, C. N. Forbes in Occas. Papers Bernice Pauahi Bishop Mus. vol. v, no. 1, p. 4, is closely allied to *H. kokio*, from which it differs in the shape of the leaves and the indumentum of the calyx (described as tomentose in the Latin description, pubescent in the English). According to Mr. Forbes, there appear to be at least two other undescribed varieties or species related to *H. kahili*.

T. A. S.

Botanical Magazine for January.—The plants figured are *Erythrina pulcherrima*, Tod. (t. 8532); *Galtonia princeps*, Decne (t. 8533); *Carpinus japonica*, Blume (t. 8534); *Primula Purdomii*, Veitch (t. 8535), and *Lonicera deflexicalyx*, Batalin (t. 8536).

The beautiful *Erythrina*, like other similar species, was introduced into Italian gardens and thence found its way to Northern Europe. Its habitat is doubtful, but it is probably Argentina. *E. Crista galli*, Linn. from Brazil (*see* t. 2161) is the nearest ally of *E. pulcherrima* but the leaflets afford an easy character by which the two species may be distinguished. The plant figured flowered in the Palm House at Kew.

Galtonia princeps like its ally *G. candicans* is an interesting plant for out-door culture and is regularly grown at Kew. Its home is the Eastern region of South Africa on the Bazeia Mountain, and near Pietermaritzburg, at altitudes of nearly 3000 ft. The specimen figured flowered in the Cambridge Botanic Garden, and was collected by Canon G. E. Mason and Miss M. H. Mason in Tembuland. It differs from *G. candicans* in having the perianth segments shorter than the tube and the stamens attached near to the base of the tube.

The Hornbeam is a handsome species belonging to a well-marked section of the genus separated by some under the name *Distegocarpus*. This section is distinguished from *Eu-carpinus* by the more numerous parallel nerves of the closely imbricated fruiting bracts and the existence of a lobe or infolded base to each bract which completely covers the nutlet. *Carpinus cordata*, Blume, distinguished by its larger leaves and basal bract-lobe is the only other species in the section *Distegocarpus*. *C. japonica* was probably first introduced to Great Britain by Mr. C. Maries in 1879, but most, if not all, of the plants now in cultivation came in 1895 from the Arnold Arboretum, or from Tokyo. The figure was prepared from a tree sent by Prof. Sargent in 1895 which is now 16 ft. high.

Primula Purdomii is an interesting species, the seed of which was collected at 10–11,000 ft. at Tao-chow in western Kansu by Mr. W. Purdom, travelling on behalf of Messrs. J. Veitch & Sons, and the plant figured was raised by them from the seed sent home. It is allied to *P. nivalis* but differs in having the lobes of the corolla more rounded and entire and in the larger stigma and probably *P. Purdomii* should only be regarded as the geographical representative in Kansu of its Siberian and N. American congener *P. nivalis*.

Another Chinese plant is represented in the final plate in *Lonicera deflexicalyx* a species belonging to the subsection *Ochranthae*, Zabel (as amended by Rehder), and allied to *L. ovalis*, Batalin, and *L. tricosantha*, Bur. & Franch., also found in Yunnan, Szechuan and Eastern Tibet. Our species is easily distinguished by its narrower leaves and by the shorter ovarian bracts. The plant which yielded material for the figure was purchased for Kew from Mr. Späth of Berlin in 1908 and now forms a considerable bush. The flowers are a rich yellow and are borne in profusion, and as the plant usually escapes being damaged by frost it makes a valuable garden shrub.

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RIBES WOLLENSE.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2] [1914

VIII.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

(WITH PLATES.)

XIV.—A New Hybrid between Gooseberry and Black Currant.

Ribes wollense, new hybrid [Saxifragaceae].

In August, 1913, some specimens of an interesting hybrid between the black currant (*Ribes nigrum*) and the gooseberry (*R. Grossularia*) were received at Kew, through Mr. W. B. Boyd, from Mr. W. J. Bell, of The Woll, Hawick, N.B. This is not the first hybrid that has occurred between the same species. About 1880, *R. Culverwellii*, Macfarlane, was raised at Thorpe Perrow in Yorkshire (*see* Gardeners' Chronicle, May 19, 1883, p. 635), and another named *R. Schneideri* (*see* Koehne in Gartenflora, 1902, p. 409) has appeared on the Continent. The plants growing at The Woll are quite distinct from both.

There are at present about a dozen bushes growing in Mr. Bell's grounds, one of which has a main stem 12 ins. in girth. The origin of the plants is not known, but they are evidently very old; Mr. Boyd thinks 60 or 70 years. An old gardener whose recollections of the place went back forty years did not remember them being planted, but knew that gooseberry bushes and black currants once grew wild on the spot. It appears probable that it was from these that the hybrid bushes were derived, the cross-fertilisation being, no doubt, effected by insect agency; but it is rather curious that neither of the parent species now grows there. The hybrid alone remains.

R. wollense is perhaps more nearly related to *R. Grossularia* than to *R. nigrum*, especially in the foliage and flower; but it shows the influence of the latter in the fruit, which is black, of the same size as the black currant, quite smooth, borne three or more on a raceme, and has a distinct suggestion of black currant in its flavour.

Description.—A deciduous shrub, about 6 ft. high, of lax, spreading habit, the lower branches prostrate; branchlets yellowish

(3122.) Wt. 212–780. 1,125. 3/14. J. T. & S. G. 14.

grey, minutely pubescent, armed with simple, stiff, slightly decurved, sharp spines $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide, scarcely so long, deeply three- (or sometimes five-) lobed, the sinuses reaching often half-way to the midrib, the lobes coarsely dentate, the teeth often gland-tipped as in *R. nigrum;* sparsely covered with short hairs on both surfaces; petiole variable in length, sometimes half as long as, sometimes longer than, the blade, pubescent. The leaves, although similar to those of the gooseberry in shape, have scattered glands beneath, and have, to a slight extent, the characteristic odour of the black currant. Flowers borne in two- or three-flowered drooping corymbs; their arrangement therefore is intermediate between the solitary flowers of *R. Grossularia* and the six- or eight-flowered raceme of *R. nigrum.* The style is clothed with white hairs at the base as in the gooseberry. Fruit glabrous, shining black when ripe, globose, $\frac{3}{8}$ in. in diameter, crowned with the shrivelled remains of the flower nearly or quite as long as itself. The taste is acid, like that of the gooseberry, but with a flavour also of black currant.

XV.—Two New Horse-Chestnuts.

Aesculus chinensis, *Bunge* [Sapindaceae].

For many years a horse-chestnut has been grown on the Continent under this name, but the true *A. chinensis* of Bunge does not appear really to have reached cultivation in Europe until introduced by W. Purdom from North China two years ago. It is possible that a single tree may have existed in the Segrez Arboretum in France, but what was usually grown under the name was in reality the Japanese *A. turbinata* (*see* Gard. Chron. June 8, 1889, p. 717).

A. chinensis is a large tree of rounded form and up to 80 or 90 ft. high. Its young shoots are glabrous or minutely downy, and its leaves five- to seven-foliolate. Leaflets narrowly obovate to narrowly oval, up to $7\frac{1}{2}$ ins. long by $2\frac{1}{2}$ ins. wide, with fifteen to eighteen pairs of veins; they are thinly pilose on the veins beneath. Panicles up to 14 ins. long and $3\frac{1}{2}$ ins. wide at the base, tapered upwards. The flowers have not been seen on cultivated plants, but they are described as white, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, the stamens rather longer than the petals. Fruit subglobose, truncate or slightly depressed at the top, 2 ins. in diameter, rough.

Like *A. indica*, the species belongs to K. Koch's section *Calothyrsus*, and should prove hardier than is that species.

A. Wilsonii, *Rehder* [Sapindaceae]. In 1900, Wilson collected in West Hupeh specimens of a horse-chestnut which was at first considered to be identical with the North Chinese tree just described. He introduced it by seeds to the Arnold Arboretum in 1908 and it has since been presented to Kew by Prof. Sargent. Besides occupying a distinct natural area, it differs from Bunge's *A. chinensis* in a number of particulars sufficient to justify Mr. Rehder in keeping it separate under the above name. Its distinctions are as follows:—Leaflets longer-stalked, not generally so markedly cuneate at the base but rounded or even subcordate there; more downy or even villose at first beneath (but becoming

glabrous in both species); veins more numerous (up to 22 pairs), forming at their junction with the midrib a more obtuse angle than in *A. chinensis;* seed larger, with the hilum covering about one-third; enclosed in a thinner-walled, ovoid to pear-shaped fruit.

With its more southern distribution this tree may prove not to be quite so hardy as *A. chinensis*, and it has been cut back once by winter cold at Kew. But that may have been due to its excessive vigour and the unripened state of its wood. Wilson believes it will be hardy, and, if so, its splendid panicles, up to 16 ins. high, should make it a welcome addition to exotic trees.

XVI.—A New Japanese Cherry.

Prunus microlepis, *Koehne* var. **Smithii,** *Koehne* [Rosaceae].

Under the erroneous name of *Prunus Miqueliana*, this cherry has been cultivated in this country for some three or four years, and has created a good deal of interest because of its flowering from November onwards. Owing probably to the excessive mildness of the late autumn of 1913, it made a very charming display at that time. When it was in flower it was sent to Professor Koehne at Berlin—the leading European authority on this genus—and he pronounced it to be a many-petalled form of his *P. microlepis*, originally described in *Plantae Wilsonianae*, i., p. 256 (1912). Normally, *P. microlepis* has five petals to each flower; for this form, which has 10 to 15, Prof. Koehne suggests the varietal name *Smithii*, to associate with the plant the name of Mr. T. Smith, of Newry, who introduced it from Japan.

It is a deciduous small tree with ovate to ovate-lanceolate, acuminate leaves, sharply serrate (the teeth gland-tipped), $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, hairy on both surfaces. Flowers, pale pink, 1 in. wide; the petals obovate, often notched at the apex. Stamens white with yellow anthers; style glabrous. Calyx, glossy green, glabrous, tubular at the base, with five reflexed, ovate lobes $\frac{1}{8}$ in. long, toothed, pointed.

XVII.—New Chinese Species.

Rhododendron fastigiatum, *Franchet* [Ericaceae].

There is a considerable demand at the present time for dwarf evergreens suitable for cultivation in the Rock Garden. Several alpine Rhododendrons introduced by Wilson are admirable for the purpose, such as *R. flavidum, R. intricatum,* and *R. nigro-punctatum.* This new species, introduced by Forrest in 1911, belongs to the same class and is likely to be useful for the same purpose. It is an evergreen shrub 6 to 18 ins. high, the young shoots, leaves and calyx being covered with scales, which give them a dull greyish tinge. The leaves are oval or ovate, averaging about $\frac{1}{2}$ in. in length, half as wide, the petiole one line long. Flowers slightly fragrant and clustered two or three together at the end of the shoot. Calyx-lobes $\frac{1}{8}$ in. long, ciliate; corolla 1 in. in diameter, pale purple, with five or six ovate lobes spreading horizontally; the tube is very short and hairy. Stamens, ten or twelve, hairy at the extreme base, much exserted, purple; anthers brownish; style purple, longer than stamens.

At first sight, both in leaf and colour of flower, this species recalls *R. intricatum* very strongly. It is, however, amply distinguished by its long stamens, those of *R. intricatum* being enclosed in the corolla-tube. It is a very dainty shrub. The seed from which the plants at Kew were raised was presented by Mr. J. C. Williams, in whose garden at Caerhays, as well as at Kew, it flowered in the autumn of 1912—less than eighteen months from the sowing of the seed. This autumn-flowering is probably abnormal. Mr. Forrest says it is the dominant species on open pasture land on the summit of the Sung-Kivee Pass, Western China.

Rubus Giraldianus, *Focke* [Rosaceae].

Among the shrubs worth planting for winter effect, the white-stemmed brambles must be counted as some of the most noteworthy. Until the recent exploration of Central and Western China by plant collectors, the best Rubus of this character was the Himalayan *R. biflorus*. Now, however, it is surpassed in grace and general effectiveness by a new species from Shen-si and Szechuan—*R. Giraldianus*. This has a very striking, fountain-like habit, the stems growing erect for 5 to 7 ft., then arching over so that the tips reach the ground. Here they form thickened nodules and push forth roots, so that the propagation of this species will be very simple. The stems are covered with a white (or blue-white) waxy bloom, which acquires its most vivid hue in October, remaining good, however, all the winter. By spring-time the bloom has become more or less worn away. The stems are biennial, reaching their full length by the first autumn, flowering the next spring and ripening the fruit, which is black, by late summer. They should then be cut out, leaving only the new stems. The leaves are pinnate, consisting usually of nine leaflets, which are ovate to rhomboidal, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, half as wide, coarsely toothed, glabrous above, covered with a close white felt beneath. Originally discovered by Giraldi, this fine Rubus was introduced into cultivation by Wilson in 1907.

Schizandra Henryi, *Clarke* [Magnoliaceae].

For many years the genus *Schizandra* was represented in gardens by only one species, *S. chinensis*, Baillon. In late years several new species have been infroduced from Western China, the most interesting amongst them, perhaps, being *S. Henryi*, which Wilson sent home in 1900 when collecting for Messrs. Veitch. A fine plant, probably the best in the country, which for several years past has been an object of great interest to arboriculturists visiting the Coombe Wood Nursery, was purchased for Kew last autumn. It is planted near the Magnolias in the Berberis Dell.

S. Henryi is a deciduous climbing shrub said to grow 20 to 30 ft. high; the young branchlets are triangular, each angle winged. Leaves coriaceous, shining, varying in shape from elliptical to ovate and cordate, 3 to 4 ins. long. The flowers are solitary on stout stalks 2 ins. long; they are each $\frac{1}{2}$ in. in diameter and white. The female flower is very interesting in the transformation that takes place after fertilisation. As in Magnolia, the carpels are

RUBUS GIRALDIANUS.

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SPIRAEA ARBOREA

arranged on a columnar receptacle which, after the flowers have faded, elongates, becomes fleshy and 2 or 3 ins. long. On this the fruits are borne in a sort of spike. The fruits have not been seen in cultivation, but they are said to be mucilaginous and eaten by the Chinese.

Spiraea arborea, *Bean* (*Sorbaria arborea,* C. K. Schneider) [Rosaceae].

This is a very promising addition to the *Sorbaria* (or pinnate-leaved) section of the genus *Spiraea,* previously represented in cultivation by *S. Lindleyana, S. Aitchisonii,* and *S. sorbifolia.* Judging by Wilson's description this new species is the most tree-like of all the Spiraeas, being sometimes 30 ft. in height. It has, palpably, a close relationship with *S. Lindleyana,* but, besides being a more robust plant, is distinguishable by the hairs beneath the leaflets being stellate (simple in *S. Lindleyana*), also by the shorter calyx-tube and longer stamens. As may be seen from our illustration, the general effect of the panicles is much the same, the flowers being of the same ivory shade of white. Wilson found it in Hupeh and Szechuan and collected it as long ago as 1900 during the first Veitchian journey, but did not apparently introduce it to cultivation until 1908 when travelling for Harvard University. It is a useful addition to a class of shrubs which it is very desirable to augment in gardens, viz., those that flower in July and later.

Tilia Oliveri, *Szyzylowicz* [Tiliaceae].

There have been for many years in cultivation two lindens whose leaves are silvery underneath, namely, *Tilia petiolaris* and *T. tomentosa* (*T. argentea*). A third has latterly been added in *T. Oliveri.* It was first discovered by Henry in the mountains north of the Yangtze-kiang as long ago as 1888. Wilson introduced it for Messrs. Veitch some twelve or thirteen years later to the Coombe Wood Nursery, where it was propagated, and whence it has since been acquired for Kew. It is a deciduous tree attaining 50 ft. in stature, its young shoots glabrous. Henry describes the leaves on wild trees as 3 to 4 ins. long and nearly as wide, but on young, cultivated ones they are as much as $6\frac{1}{2}$ ins. long and $5\frac{1}{2}$ ins. wide; the upper surface is dark green, glabrous; the lower one clothed with a close white felt. Flowers have probably not yet been borne by cultivated plants, but the cymes on wild specimens are 3 ins. long, carrying about twenty flowers. Fruit globose, $\frac{1}{3}$ in. in diameter, apiculate, warted and covered with grey tomentum.

Tilia Oliveri is succeeding very well under cultivation and promises to be at least as ornamental a tree as *T. tomentosa.* From that species and *T. petiolaris,* the only other limes with which it is likely to be confused, it is easily distinguished by its quite glabrous young branchlets.

Viburnum Harryanum, *Rehder* [Caprifoliaceae].

An evergreen shrub ultimately 6 to 8 ft. high of bushy habit; young shoots clothed with a minute dark pubescence. Leaves orbicular to obovate, or broadly ovate, tapered at the base, rounded

at the apex, mucronate; margins entire or with a few obscure teeth; $\frac{1}{4}$ to 1 in. long, from two-thirds to nearly as wide; dark dull green above, paler beneath, perfectly glabrous; petiole $\frac{1}{12}$ in. long, reddish. Inflorescence a terminal compound umbel 1 to $1\frac{1}{2}$ ins. across; peduncle glabrous, $\frac{3}{4}$ to 1 in. long. Flowers unknown. Fruit pointed, ovoid, $\frac{1}{6}$ in. long, black, shining.

Wilson discovered this remarkable Viburnum in 1904 in Western China, on his second journey for Messrs. Veitch. It has recently been named in honour of the head of that firm, Sir Harry Veitch. Wilson (under his No. 3733, Veitchian journey) notes that he found it on mountains up to 9000 feet, but that it was rare. It is perfectly distinct from any other evergreen Viburnum in the smallness of its leaves, which give it rather the aspect of a privet than a Viburnum. It has recently been added to the Kew collection by purchase from Coombe Wood. Judging by the quick and easy way cuttings have taken root, even in late autumn, its place in gardens should be assured, especially if it proves to have any ornamental qualities at all commensurate with its interest and distinctness.

IX.—THE GENUS ATICHIA.

A. D. Cotton.

Introduction.

During the early part of last winter an interesting organism was forwarded to Kew from Dominica by Dr. Francis Watts, Commissioner of Agriculture for the West Indies. The plant proved to be a new species of *Atichia*, a genus of fungi of obscure affinity, and until recently but imperfectly known. As species of *Atichia* have never before been received at Kew for examination, it has been thought advisable to give an account not only of the West Indian plant, but also of the genus as a whole, together with a conspectus of the known species.

The specimens forwarded to Kew were found by Mr. J. Jones, Curator of the Botanic Station, on a plantation of limes at Senhouse Estate, Dominica, and sent to Mr. F. W. South, at that time Mycologist in the Imperial Department of Agriculture for the West Indies. The organism occurred on the upper side of the lime leaves, and appeared as small black star-shaped bodies 4–5 mm. in diameter (Fig. 1). The leaves themselves were infected with the scale *Lepidosaphes beckii*, and as the fungus was usually attached to the latter it was thought that it might possibly be parasitic. Several other fungi were present on the leaves forwarded, some of which were connected with the scale insect others not, but all, with the exception of the organism mentioned above, were referable to well-known fungus genera. The star-shaped bodies resembled a lichen such as *Collema* in appearance, being gelatinous and swelling when moistened after the manner of species of that genus. In structure, however, they showed a resemblance to certain members of the Red Algae (*Florideae*) being composed of branched moniliform filaments more or less

held together in mucilage, loosely arranged in the centre and more compact towards the periphery. The general structure was utterly unlike that of an ordinary fungus, and from an alga the plant differed in the fact that the filaments were apparently devoid of colouring matter, whilst from a lichen they were equally distinct through the absence of gonidia—the algal cells characteristic of that group. As no bodies which could be definitely referred to spores were present, the organism was set aside until fertile specimens should be obtained, and a request was forwarded to Dr. Watts asking for further material and for information on the colour of the cell-contents when fresh.

Additional supplies were subsequently received from Mr. J. Jones, Curator of the Botanic Station, Dominica, and through the Commissioner of Agriculture, and these gave the necessary clue for identification. One of these samples provided the conidia-like spores, and the other abundance of asci and ascospores. The presence of asci proved that the plant was not an alga, and, the absence of gonidia being confirmed, its place had to be sought amongst the fungi. Here it was ultimately traced to the genus *Atichia*, which, on account of its having been originally described as a lichen, had been omitted from Saccardo's *Sylloge Fungorum*. For half a century the genus had contained but a single minute species *A. glomerulosa*, but during recent years several others had been added, an account of which is given below.

History of the Genus.

The genus *Atichia* was founded by Flotow in 1850 for the reception of *Collema glomerulosum*, Ach., a gelatinous plant which occurs as wart-like masses 1–2 mm. in diameter on leaves of conifers in Southern Europe. Flotow noted its peculiar structure and the entire absence of green colour in the tissues, but states he had no hesitation in leaving it in the lichen family *Collemaceae*. He named it *A. Mosigii*, not *A. glomerulosa* as has been assumed by subsequent writers. In 1870 (Brit. Mus. copy) Millardet, in a memoir on the *Collemaceae*, gave a full account of the structure of this plant, illustrated with beautiful figures. He employs here Flotow's name *A. Mosigii* though he had previously referred to it as *Hyphodictyon lichenoides* (gen. et sp. nov.). Millardet also described reproductive bodies which he termed conidia. From that date till 1900 nothing appears to have been added to our knowledge of the genus though several poorly described fungi which had been referred to various groups are now known to represent species of *Atichia*. Saccardo omitted the genus altogether from his *Sylloge*, but in Rabenhorst's *Cryptogamen Flora* it is placed by Rehm as a genus of doubtful position in an appendix to the *Bulgariaceae* (iii., p. 500). The first writer who rejected the plant as a lichen was Millardet, and Stein was the author who proposed the combination *Atichia glomerulosa* (Cohn, Cryptogamen Flora von Schliessen, ii. p. 356, 1879).

Ascospores were first found in a species discovered in Java, material being collected by Count Solms-Laubach, and shortly after by Raciborski. A note on Solms' specimens was given by R. Wagner ('00), who remarks that the plant is an Ascomycete pos-

sessing the peculiar structure of *Atichia*. He names it *Atichiopsis Solmsii*, preferring not to link it more closely with Flotow's genus. The full description promised was not published. A few months previous to this, Raciborski, in the third instalment of his notices on Javan fungi, includes a brief account of *A. Millardeti*, sp. nov. ('00, p. 41). He states that the fungus is common in Java on various hosts, and describes the asci, which contained two-celled coloured spores, as occurring in a layer under the surface of special swollen portions of the thallus. His account, though brief, is more detailed than Wagner's, and it was followed some years later by a full description ('09, p. 369). The general structure of the fungus agreed so exactly with *Atichia glomerulosa* that there was no reason to regard it as generically distinct. According to von Höhnel, Wagner's plant is the same as Raciborski's but his name *Atichiopsis Solmsii* a *nomen nudum*, hence, he states, *A. Millardeti* has priority. Apart, however, from this point, Raciborski's name must stand in preference to Wagner's as it antedates his by a few weeks.*

With the exception of von Höhnel's paper to be noted immediately the other contributions to our knowledge of the genus have been made by French botanists, who have dealt with it under the name *Seuratia*. This genus was proposed by Patouillard in 1904 for a plant obtained by Seurat in Gambier Islands (Polynesia), and a single species, *S. coffeicola*, was first described. As explained later, this plant is the same as *A. Millardeti*, Rac. *Seuratia* was placed by Patouillard amongst the *Capnodiaceae*, though he notes that it differs from the other genera in several particulars, namely, in the absence of superficial mycelium, the gelatinous consistency, and the peculiar dehiscence. In 1905, however, Vuilleman made it the type of a new family, and at the same time described *S. pinicola* sp. nov. on *Pinus halepensis* in the South of France. This plant is obviously, as von Höhnel remarks, the ascigerous stage of the original *A. glomerulosa*. The following year Patouillard described another species, from Tahiti, *S. Vanillae*, on leaves of *Vanilla planifolia* ('06). Von Höhnel's useful paper appeared four years later, though it was preceded by a note in his *Fragmente* ('09, no. 333). In the paper he summarises previous work, points out the identity of *Seuratia* with *Atichia*, and describes *A. Treubii* sp. nov. from material collected by himself in Buitenzorg. Von Höhnel also removes the Hyphomycete *Heterobotrys paradoxa*, Sacc., to the present genus, and, though he did not apparently see the specimen, proposed the new species *A. paradoxa*.

The latest contribution to the subject is by Mangin and Patouillard ('12), who give for the first time a full and illustrated account of the several reproductive bodies. These authors retain the genus *Seuratia* Pat., but remove the plant previously described by one of them as *S. Vanillae* to a new genus *Phycopsis*, on account of the very distinct manner in which the clusters of conidial cells are produced. They also describe the new species *A. Tonduzi*.

* Raciborski's paper, Parasitische Algen und Pilze Javas iii., was received at Kew in July, whereas Wagner's note appeared in the August number of the Oestr. Bot. Zeit.

During recent years Saccardo has included these plants in his *Sylloge*, listing first Patouillard's species *Seuratia coffeicola* (= *A. Millardeti*, Rac.) in the supplement which appeared in 1905 (vol. xvii. p. 558). Subsequently he adopted the name *Atichia*, and in a later supplement (vol. xxii. p. 769, Aug. 1913) he records under that name all species which had appeared up to 1910.

Structure.

The structure of the *Atichia* thallus agrees in a general way with that described for the Dominica plant. The thallus itself is either an irregular wart-like or coralloid mass, or a flattened more or less stellately branched body attached below by a small central point. It is composed of a system of torulose almost articulated filaments held together in mucilage. The filaments branch irregularly and probably anastomose; towards the periphery the branching is dichotomous and the cells smaller and more closely packed, so that a denser cortical layer results. These terminal cells are not, however, laterally united, but remain free as in such an alga as *Nemastoma*. The mucilage is derived from the outer layers of the cell-wall, and the amount present varies considerably in different specimens, being most abundant in old plants. The thallus is colourless within, but externally it is black, owing largely to the peripheral cells being dark in colour.

Three kinds of reproductive organs are known, ascospores, conidia-like cells which adhere in clusters, and pycnidia. With regard to the asci, no definite apothecia or perithecia are produced, but any part of the upper surface of the thallus may become fertile and develop asci between the moniliform filaments in the cortical layer. In some species the fertile portion is swollen in the form of cushion-like pads, which in extreme cases may almost amount to discoid branches. The asci are oval and contain two-celled hyaline or subhyaline spores.* The conidial type of reproduction is even more unusual than the ascigerous. The spores do not occur singly but in clusters, each of which remains intact on liberation, and are produced in great quantities in cavities in the thallus. Mangin and Patouillard, who have carefully worked out the development, term these cell-clusters "propagula," and compare them with the soredia of lichens. There is little doubt that they represent a very abnormal form of conidial development. The propagula themselves are produced in dense masses in the circular or elongated cavities, and are well illustrated in Mangin and Patouillard's paper ('12, Fig. 1). The development of the cells composing the propagulum is remarkable, and consists of successive budding in certain definite directions. The whole thus assumes a characteristic form, which is sufficiently well marked in the different species to afford good specific characters. The genus *Phycopsis*, formed for the reception of *Seuratia Vanillae*, differs

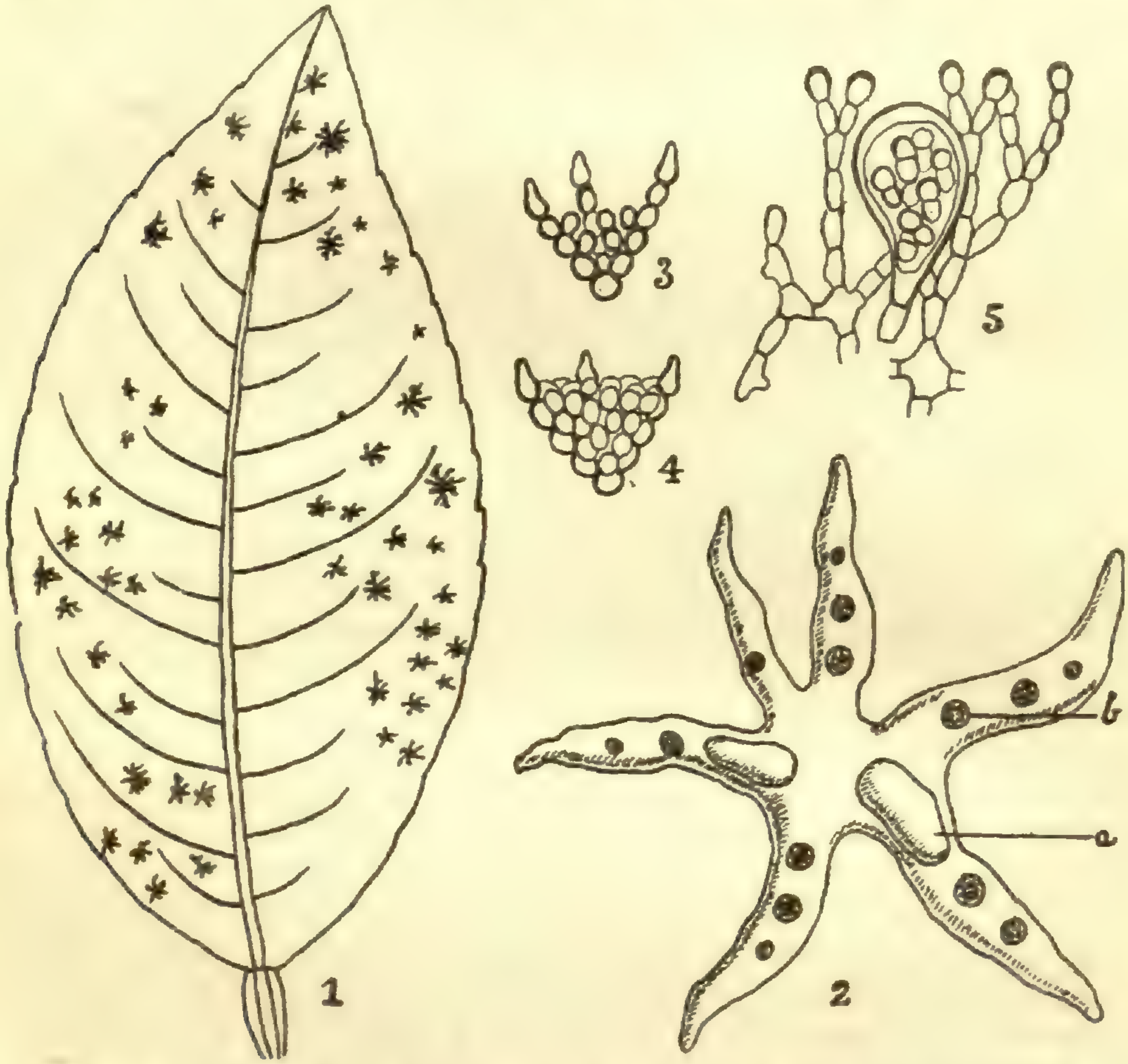
*Raciborski states ('00, p. 41) that the spores of his species are brown, and later ('09, p. 370) that they are (merely) brown-walled ("hellbraunwandig"). An examination of the type-specimens kindly forwarded to Kew by Prof. Raciborski shows that when still in the ascus the spores are practically hyaline, though it is possible that if examined on the spot after natural dehiscence they may be brown-walled.

in the propagula occurring in an isolated manner instead of in dense aggregations. Pycnidia have been described by the above mentioned French authors for *A. Millardeti.* These are found scattered in the thallus on both ascigerous and conidia-bearing plants, and do not show any structural peculiarity.

For specific distinctions the form and size of the thallus have to be noted, but more especially the distribution of the propagula and the arrangement of their component cells. The ascospores vary slightly in size, but otherwise they are singularly constant.

The Dominica Plant.

On close examination the West Indian specimens were found to be distinct from all species previously described. Though in habit and general appearance they very closely resemble both *A. Millardeti* and *A. Tonduzi*, they differ in the form and arrangement of the propagula. In the former these bodies are produced in oval or elongated cavities, and are triquetrous with terminal hairs; in the latter the cavities are circular and the propagula are irregular or botryoidal in form. The Dominica plant possesses



1. Leaf of *Citrus Medica* with *Atichia dominicana* nat. size.
2. Plant of *A. dominicana* showing irregular swellings containing asci *a*, and conidial cavities *b* × 15.
3. Young propagulum showing the budding off of cells from the 3 primary branches × 400.
4. Mature propagulum × 400.
5. Section through thallus showing peripheral filaments and an ascus × 400.

small round receptacles (Fig. 2) with triquetrous propagula devoid of hairs (Figs. 3 and 4). It had therefore to be described as a new species of which the following is the diagnosis:—

A. dominicana, *Cotton;* ab *A. Tonduzo,* Mang. et. Pat., triquetris propagulis differt.

Thallus gelatinosus, nigricans, applanatus, stellato-ramosus, contextu ex filamentis torulosis muco immersis constituto, articulis hyalinis ovoideis vel pyriformibus 5–10 μ longis, ultimis fuliginosis minoribus globosis. Rami horizontales, patentes, simplices aut furcati, teretes, fertiles inflato-nodulosi. Asci sub superficie dispositi, in ramis normalibus aut intumescentibus propriis evoluti, 45–50 × 25–28 μ, sporis hyalinis bicellularibus ovoideis utrinque rotundatis medio constrictis 17–20 × 8–10 μ. Propagula (conidia in gregos collecta) in corbulis rotundis facie superiore thalli evoluta, triquetra 20–30 μ longa, ex cellulis ovalis 5–6 × 4 μ composita, absque pila.

Hab. In foliis *Citri Medicae,* saepe ad scutellis *Lepidosaphis beckii.*

West Indies. Dominica: Senhouse Estate, *J. Jones* 139.

Life-History and Biology.

With regard to the biology of *Atichia* the following items may be recorded. Of the early stages of the plant little is known, but the material forwarded from Dominica supplied a series of specimens showing all stages from the budding propagulum to the mature plant. Some of the leaves received were covered with the mycelium of one of the Sooty Moulds (*Capnodiaceae*), and on this the propagula had become entangled. In the earliest stages their triquetrous outline is still visible, but owing to successive budding this is soon lost and the mass becomes spherical. When about 50 μ in diameter these masses begin to assume, but on a compressed scale, the same type of structure as the mature plant, and show differentiation into a soft loosely arranged interior, and a denser cortical layer. These observations are important in showing that *Atichia* is a distinct fungus, and not a stage in the life-history of *Capnodium* or other genus as some writers have thought. Proof of this, however, was not needed, as Mangin and Patouillard's researches place the question beyond doubt. The ray-like branches begin to protrude as lateral outgrowths when the plant is quite young (about 1 mm. in diameter), four or five rays first appearing, but others follow so that the mature plant may be 7–10 rayed. The rays, which are of unequal length, often remain simple, but occasionally they fork or produce short lateral branches. A considerable variation in form is thus found, even in specimens occurring close to each other; a point which should inculcate caution with regard to the use of external form in this genus. An even greater variation appears to be displayed by *A. Millardeti* and *A. Tonduzi.*

From what has been said it will be seen that there is no necessary connection between the fungus *A. dominicana* and the scale *Lepidosaphes beckii,* though as a fact it is often found attached to the latter. Some of the lime leaves forwarded were very badly

attacked by this pest, and the effect is seen in the presence of sooty moulds and other fungi. The leaves of Raciborski's specimens are quite clean, and the fungus is sparsely scattered and attached directly to the leaf. The same is also true of some specimens of *A. dominicana*, this being particularly the case in the second batch forwarded.

Raciborski notes an interesting point with regard to the production of spores in *A. Millardeti* ('09 p. 370). He states that the formation of asci appears to coincide with the advent of the East monsoon, whilst during the West monsoon conidia are produced. Evidence of such periodicity is to be seen in the West Indian material. The first batch forwarded (collected November, 1912) was either sterile or contained conidia only; the second gathering (collected in February, 1913) possessed conidia in abundance; whilst in the third supply (collected March 15, 1913), almost every specimen is in full ascigerous fruit, though old conidial cavities are also visible. Seasonal development of spores was also noted by Neger in the plant he examined in Chile (see later).

Systematic and Critical.

As far as fungi that have been described under the name of *Atichia* and *Seuratia* are concerned little revision is necessary, but in order to make the survey of the family as complete as possible, other plants which have been detected as possibly representing species of *Atichia* are considered below, and in most cases the original material has been obtained and examined.

With regard to the plants described by French authors, *Phycopsis Vanillae* is undoubtedly a very marked species and well worthy of the generic rank assigned to it by Mangin et Patouillard. *Seuratia Tonduzi*, specimens of which were kindly sent by Prof. Mangin, is distinct in its large size and botryoidal propagula, but on the grounds of priority it should be known as *Atichia Tonduzi*. The identity of *S. coffeicola*, Pat. with *A. Millardeti*, Rac. had been proved by von Höhnel, who examined type specimens of both species, but with the publication of fuller details (Mangin and Patouillard, '12) a few points arose which required re-investigation. Prof. Raciborski kindly forwarded a portion of his original material, the examination of which placed the identity of the two plants beyond dispute, the detailed drawings of the French authors agreeing in every particular with the Javan plant.

Various *Hyphomycetes* were next examined. Von Höhnel pointed out the possibility of *Torula Lechleriana* being a member of the genus, and also *Heterobotrys paradoxa*. In response to a request Prof. P. A. Saccardo was kind enough to send the original specimens on loan to Kew, and also *H. paradoxa* subsp. *chilensis* Sacc. and Syd. The examination of these gave the following results:—

Torula Lechleriana, Sacc. Not an *Atichia*, but apparently rightly placed by Saccardo in the genus *Torula*.

Heterobotrys paradoxa, Sacc. In Sylloge xxii. p. 769, Saccardo suggests that this plant is a synonym of *A. Tonduzi*, whereas von Höhnel had proposed the name *A. paradoxa* sp. nov. ('10, p. 27). The type shows that it is an *Atichia* and closely allied to *A. glome-*

rulosa. The host-plant, however, is *Euonymus japonicus* and not a conifer, and the material very scanty; hence until collected again and further examined it seems advisable to leave the plant as *A. paradoxa*.

H. paradoxa, subsp. *chilensis*, Sacc. and Syd. The type of this shows a typical *Atichia* structure, but the plant is distinct from *A. paradoxa* in its stellate form. It is allied to *A. Tonduzi*, Mang. et Pat., but differs in the much smaller propagula, which are roughly spherical and measure 14–17 μ diameter. It is apparently distinct from all other species, and may be named *A. chilensis*, sp. nov. The fungus described by Neger ('06) as being a stage in the life-history of *Antennaria scoriadea*, and alluded to by von Höhnel, must be referred to here. The description of the gelatinous star-shaped bodies, and of the clusters of spores comparable to those of *Coniothecium* was strongly suggestive of the present genus. Prof. Neger favoured Kew with the loan of authentic material, and from this it is evident that the plant is not *A. chilensis*, as might have been supposed, but a distinct and probably new species having the habit of *A. glomerulosa* but with different and larger propagula. The propagula are very scarce in the material forwarded, and insufficiently developed for a more definite statement to be made.

Two other fungi, or rather two other forms in the so-called life-history of certain species, should likewise be placed in *Atichia*. The species of *Capnodium* described by Bernard ('07) have been the subject of comment by more than one writer. Thus Vuilleman (*Comptes rendus*, t. 146, p. 307), rightly points out that certain fungi described by him as stages in *Capnodium stellatum*, Bern., and *C. javanicum*, Zimm., are entities, and clearly represent *Seuratia*. The type specimens of these two plants are at Buitenzorg and have not been examined. Being Javan plants one would be inclined to refer them to *A. Millardeti*, which Raciborski states is a frequent epiphyte in that region, but the propagula suggest rather *A. Tonduzi*, though they do not entirely agree with that species. These two plants must be left for future enquiry, as from the description and figures it is not possible to determine their specific identity.

Saccardo's suggestion (*Syll.* xxii. p. 769), that his genus *Actinonomma* may possibly find a place here has not been investigated, as the Kew specimens are insufficient for the purpose; but the presence of numerous hairs on the thallus is not in agreement with the plants we have been considering, and indicates a different affinity. This concludes the survey of the *Atichia*-like fungi. It is possible that other species or spore-forms which have been described will ultimately be found to belong to the present genus, but the above includes all those that have so far been detected.

With regard to the position of the genus great difference of opinion has existed. After its removal from the *Collemaceae* it was placed in a special family next to the *Myriangiaceae* by Raciborski, in the *Capnodiaceae* by Patouillard, in the *Saccharomycetes* by von Höhnel, whilst Vuilleman regarded it as the type of a distinct family in the *Perisporiales*. Though not closely allied to any other family this is perhaps the most convenient position

in which to place it, but the name *Atichiaceae* rather than *Seuratiaceae* should be adopted. It is sharply defined by the gelatinous thallus, by the absence of ordinary mycelium and true apothecia, and by the remarkable propagula. Mangin and Patouillard are of opinion that the absence of mycelium is sufficiently important to warrant the separation of *Atichia* from other *Ascomycetes*. They regard the family as an autonomous type parallel to the filamentous *Ascomycetes*, and they suggest that it represents an abortive offshoot of the *Florideae*.

Conspectus of Species of Atichiaceae.

1. **Phycopsis Vanillae,** *Mang. et Pat.* in Comp. Rend. cliv. p. 1480, fig. 2. *Seuratia Vanillae*, Pat. in Bull Soc. Myc. xxii. p. 54, pl. i., fig. 4. *Atichia Vanillae*, von Höhnel in Ann. Jard. bot. Buitenzorg, 1910, Supp. iii. p. 27 (ex errore *vanillicola*).

Polynesia: Tahiti. On leaves of *Vanilla planifolia*.

Distinguished from *Atichia* by the scattered propagula.

2. **Atichia glomerulosa,** *Stein* in Cohn Crypt. Flora ii. part 2, p. 356; von Höhnel, *l.c.*, p. 19. *Collema glomerulosum*, Ach. Lich. Univ. p. 641. *Synalissa glomerulosa*, Nyl. Enum. Lich. p. 88. *Atichia Mosigii*, Flot. in Linnaea xxiii. p. 150; Millardet in Mem. Soc. sci. nat. Strassb. vi. p. 60, 3 tab. *Hyphodictyon lichenoides*, Millardet in Act. Soc. Helv. 1866, p. 85. *Seuratia pinicola*, Vuilleman in Bull. Soc. Myc. xxi. p. 74, pl. 4.

S. Europe. On leaves and shoots of *Picea* and other conifers.

3. **A. paradoxa,** *von Höhnel, l.c.*, p. 27. *Heterobotrys paradoxa*, Sacc. Michelia ii. p. 124.

France: Rouen. On leaves of *Euonymus japonicus*.

This species is insufficiently known and may be a synonym of the last.

4. **A. Millardeti,** *Rac.* in Bot. Inst. Buitenzorg, 1900, p. 41; in Bull. de l'Acad. Sci. Cracovie, 1909, p. 369; von Höhnel, l.c. p. 27. *Atichiopsis Solmsii*, R. Wagn. in Oestr. Bot. Zeitschr. L. p. 304. *Seuratia coffeicola*, Pat. in Bull. Soc. Myc. xx. p. 136, fig. 1; *ibid.*, xxii. p. 53; Mang. et Pat. in Comp. Rend. cliv. p. 1477, fig. 1 (cf. *Capnodium stellare*, Bern. in Bull. Dept. Ag. Ind. Néerl. No. xi. pp. 1–24).

Malaya: Java. Polynesia: Gambier Islands and Tahiti. On leaves of *Coffea arabica*, *Styrax Benzoin*, *Cinnamomum zeylanicum* and other plants.

This species is easily distinguished by the three hairs on the triquetrous propagula.

5. **A. Treubii,** *von Höhnel*, l.c. p. 27.

Malaya: Java. On leaves of *Ficus elastica*.

A very minute species and probably easily overlooked.

6. **A. Tonduzi,** comb. nov. *Seuratia Tonduzi*, Mang. et Pat. l.c. p. 1480, fig. 1.

Central America: Costa Rica. On *Anthurium* sp.

A fine large species distinguished by the irregular globose or botryoidal propagula, which may be 30–35 μ across.

7. **A. dominicana,** sp. nov.

West Indies: Dominica. On leaves of *Citrus Medica.*

Distinguished by the small triquetrous propagula devoid of hairs.

8. **A. chilensis,** comb. nov. *Heterobotrys paradoxa,* subsp. *chilensis,* Sacc. et Syd. in Ann. myc. ii. p. 172. *Antennaria scoriadea* Berk., Neger in Bakt. Centr., ii. p. 613 (*p.p., non alibi*).

Chile: Villarica. On leaves of various plants.

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X.—ENUMERATION OF T. A. SPRAGUE'S SOUTH AMERICAN PLANTS: GAMOPETALAE.

H. F. Wernham.

The plants enumerated in the present paper were collected during the course of an expedition through Venezuela and

Colombia in 1898–99 (*see* Trans. Bot. Soc. Edin. xxii. pp. 425–434).

The Polypetalae were worked out by the collector, but only diagnoses of the new species were published, as it was intended that the list of plants collected should appear as a whole. It has now been decided to publish the enumeration in parts, and the present instalment, comprising the *Rubiaceae*, will be followed by others, including the Polypetalae and the remainder of the Gamopetalae.

Rubiaceae.

Joosia umbellifera, *Karst.* Flor. Columb. i. 9, t. 5 (1858).

Colombia. San Martin District: Villavicencio, fl. Jan. *Sprague* 134. Small tree with white flowers.

Distrib. Colombia and Peru.

Manettia coccinea, *Griseb.* Fl. Br. W. Ind. 329. A form with 4 calyx-lobes instead of 8.

Colombia. San Martin District: Villavicencio, fr. Jan. *Sprague.*

Distrib. Central America, West Indies, Guiana, and Western tropical South America.

Manettia coccocypseloides, *Wernham;* affinis *M. racemosae,* Ruiz et Pav., a qua floribus paucioribus minoribus, forma calycis corollaeque distinguitur.

Herba debilis scandens, caule sparse et obscure puberulo subnitente; *foliis* lanceolatis vel ovato-lanceolatis, circiter 4·5 cm. × 1·7 cm., acuminatis acutissimis, utrinque sparsiuscule griseo-puberulis, petiolo brevi ad 8 mm. longo; *stipulis* parvis late ovatis; *floribus* albis circiter 1 cm. longis in cymis corymbosis paucifloris, pedunculo vix 1·5 cm. longo qua ramuli et pedicelli graciles ad 5 mm. sparsiuscule puberulo; *bracteis* ovalibus mucronatis ad circiter 5 mm. × 2·5 mm. ut folia indutis; *calycis* lobis 4 linearioblongis, 3–4 mm. longis; *corolla* extra puberula inter minimas tubo gracili insuper leniter nec multo ampliato demum glabrescente; *capsula* subglobosa sparse puberula tardius glabrescente.

Colombia. Tolima: Pitalito, fl. and fr. March, *Sprague* 244.

A delicate little herb, allied to the Venezuelan *M. racemosa,* but readily distinguished by the much smaller flowers fewer together, and the differently shaped calyx and corolla.

Sipanea acinifolia, *Spruce ex Sprague* in Trans. & Proc. Bot. Soc. Edin. xxii. 433 (1904).

Venezuela. Caicara, Orinoco, in savanna near a clump of Moriche palms, fl. Nov. *Sprague* 7.

Distrib. Lower Orinoco and Lower Amazons. The only other known specimen was collected at Santarem by Spruce. Sprague's specimen seems to have abnormally large flowers, and may possibly be a variety.

Limnosipanea palustris, *Hook. f.* Ic. Pl. t. 1050. *Sipania palustris,* Seem. Bot. Herald, 136 (1852).

Colombia. Cabuyaro, Rio Meta, fr. Jan. *Sprague* 57.

Distrib. Panama and Colombia.

Oldenlandia herbacea, *DC.* Prodr. iv. 425 (1830).

Colombia. Cabuyaro, Rio Meta, edge of wood, fr. Jan. *Sprague* 28.

Distrib. Fairly general throughout the tropics.

Isertia Spraguei, *Wernham;* affinis *I. Purdiei,* Sprague, a qua corollae forma ac indumento differt.

Arbor ramulis sulcatis sparsiuscule minute asperulo-pubescentibus; *foliis* 26–38 cm. × 12–16 cm. ellipticis vel elliptico-oblongis, brevissime leniterque acuminatis obtusis, supra glabris subnitentibus, subtus inter venas minute griseo-tomentosis, in costa media prominente venisque secundariis utrinque ad 25 tenuibus siccitate nigricantibus necnon in reticulo interveniente conspicuo tamen tenui obscure minutissime pubescentibus; *petiolo* subterete similiter induto ad 5·5 cm. nonnunquam longiore; *stipulis* fere ad basin in partibus triangulari-lanceolatis acuminatis acutis rigidiusculis 1–1·5 cm. longis saepe distantibus divisis; *inflorescentia* subpyramidali thyrsoidea ramulis sparse in axillis densius pubescentibus tandem deflexis; *calycis* glabri limbo integerrimo brevissimo; *corollae* tubo extra sparse minute pubescente 4–4·5 cm. longo, insuper leniter usque ad in ore 1·2 cm. lato ampliato, lobis ovalibus apice rotundatis 1·1 cm. × 6 mm.; *stylo* pubescente, *stigmatibus* 2 glabratis suborbicularibus; *baccis glabris bilocularibus.*

Colombia. Eastern Cordilleras between Pitalito (Tolima) and ratis suborbicularibus; *baccis* glabris bilocularibus.

Isertia alba, *Sprague* in Trans. & Proc. Bot Soc. Edin. xxii. 434 (1905). By a clerical error the wrong specimen and locality were quoted for this species. The correct data are now given.

Peruvian Amazons. Yurimaguas, Huallaga River, in secondary forest, fl. May, *Spruce* 3878.

Gonzalea tomentosa, *Humb. et Bonpl.* Pl. Aeq. i. 225, t. 64 (1808).

Colombia. Tolima: San Augustin, fl. March, *Sprague* 297.

Distrib. Western Tropical South America.

Sabicea camporum, *Sprague* in Trans. & Proc. Bot. Soc. Edin. xxii. 434 (1904).

Colombia. Cabuyaro, Rio Meta, fl. Jan. *Sprague* 43.

Hamelia lutea, *Rohr. ex Smith* in Rees, Cycl. v. 17, n. 4 (1811).

Colombia. Caquetá District: San José, Rio Putumayo, fl. and fr. Aug. *Sprague* 611. Flowers yellow.

Distrib. Generally in tropical America.

Hamelia patens, *Jacq.* Stirp. Amer. 72, t. 50 (1763).

Colombia. San Martin District: Villavicencio, fl. Jan. *Sprague* 110.

A glabrescent form (*see* Wernham, Journ. Bot. 1911, xlix. 214), with minutely scabrid leaves.

Distrib. Tropical America, Mexico, and Paraguay.

Bertiera guianensis, *Aubl.* Pl. Guian. i. 180, t. 69 (1775).

Colombia. San Martin District: Villavicencio, fl. and fr. Jan. *Sprague* 91.

Distrib. Generally in tropical America.

Alibertia pedicellata, *Wernham;* floribus in racemulo abbreviato valde bracteato dispositis distincta.

Arbor glabra ramulis rectis cortice striato; *foliis* pergamentaceis oblanceolatis ad obovatis vel ellipticis 16–20 cm. × 5·5–8·5 cm., utrinque angustatis, venis secundariis utrinque circiter 10 subtus qua centralis supra impressa prominentibus, reticulo tertiario valde conspicuo, petiolo 1–1·5 cm. glabro; *stipulis* late oblongo-triangularibus cuspidatis ad 5 mm. × 7–8 mm.; *floribus* in racemulo abbreviato 1–1·5 cm. longo dispositis; *bracteis* et bracteolis triangularibus subacutis ad 5 mm. × 3 mm. concavis; *pedicellis* minutissime pubescentibus griseo-furfuraceis fructu ad 6–7 mm. accrescentibus; *bacca* ellipsoidea glabra 2·5 cm. longa 1·8 cm. lata a calycis limbo dentibus 5 brevibus latis subacutis coronata.

Colombia. Caquetá District: Mocoa, fr. May, *Sprague* 362; *Triana* 1833.

Remarkable for the characters of the inflorescence—especially the pedicels.

Duroia Spraguei, *Wernham;* affinis *D. hirsutae,* K. Schum., a qua floribus solitariis multo hispidioribus recedit.

Arbor; foliis validiuscule pergamentaceis late oblanceolatis ad circiter 23 cm. × 10 cm., basin versus angustatis petiolo hispido circiter 1·5 cm. longo, apice cuspidatis acutis acumine vix 1·5 cm. excedente, supra sparsiuscule in venis hispido-hirtis, subtus in venis conspicuis centrali valde prominente dense secundariis sparsius utrinque circiter 15 hispidis, margine ciliato, aliter hirtellis ad glabratis; *floribus* subsolitariis; *calycis* dense sericeo-hispidi lobis subulato-setaceis alabastro ad 8–9 mm., tubo circiter 5 mm.; *corolla* extra sericea; *ovario* ellipsoideo densissime longe sericeo-hispidissimo, alabastro 1·3 cm. × 8 mm.

Colombia. Caquetá District: Mocoa, *Sprague* 369; *Triana.*

Approaches *D. hirsuta,* K. Schum., but differs in the relatively broader leaves with longer stalks and shorter, more cuspidate acumen; and in the solitary, much more hispid, and larger flowers. Native name: "Taruquillo."

Posoqueria Spraguei, *Wernham;* affinis *P. decorae,* DC., a qua corollae tubo multo longiore et calycis dentium forma recedit.

Frutex glaberrimus ramulis tetragonis; *foliis* ovalibus ad circiter 25 cm. × 12 cm. brevissime acuminatis apice acutissimo; *petiolo* brevissimo 1 cm. vix attingente; *stipulis* primo triangularibus demum ovatis basin versus constrictis vix connatis nec vaginantibus apice obtuso circiter 2·2 cm. × 1·3 cm.; *inflorescentia* pauciflora, pedicellis ad 1 cm. longis; *calycis* dentibus triangularibus obtusis circiter 1·5 mm. × 1·5 mm.; *corollae* tubo angustissimo longissimo 23 cm. excedente latitudinem 3 mm. nec attingente insuper vix ampliato, lobis oblongis obtusis ad 3·5 cm. × 5 mm.; *antheris* dorso puberulis oblongis circiter 7 mm. longis, filamentis ad 1 cm. exsertis.

Colombia. Caquetá District: San José, in a creek of the River Putumayo, fl. Aug. *Sprague.*

A very distinct species, its nearest ally being *P. decora,* DC., from which it differs especially in the much longer corolla-tube and differently-shaped calyx-teeth.

Geophila reniformis, *D. Don*, Prodr. Fl. Nep. 136.
COLOMBIA. Caquetá District: Mocoa, *Sprague* 404.
Distrib. Generally throughout the tropics.

Cephaelis sp.
COLOMBIA. Caquetá District: Mocoa, fr. May, *Sprague* 378. Tree 5 m. high, 12·5 cm. in diameter. Probably a *Cephaelis;* cannot be described in the absence of flowers.

Psychotria acuminata, *Benth.* Bot. Sulph. 107 (1844).
COLOMBIA. Caquetá District: Mocoa, *Sprague* 405.
Distrib. Colombia. A broad-leaved variety has been found in Nicaragua.

Psychotria Spraguei, *Wernham;* similis *P. trichocephalae,* Poepp. et Endl., a qua calycis segmentis elongatis et indumento foliorum differt; ab affini *P. horridula,* Muell. Arg., inflorescentia multiflora distinguitur.

Frutex; foliis lanceolatis vel anguste oblongis circiter 12–15 cm. × 3·5–4·5 cm. utrinque angustatis subacutis acuminatis utrinque praesertim subtus in venis densiuscule hispidis olivaceo-viridibus, petiolo circiter 1·5 cm. hispidissimo; *stipulis* ovatis insuper bifidis subulato-caudatis rigidis ad 2·5 cm. longis; *inflorescentia* subcapitata multiflora; *bracteis* bracteolisque extra pilis articulatis hispidissimis indutis lanceolatis ad linearibus apicibus setaceis exterioribus nonnunquam ovatis subtrilobatis; *calycis* limbo fere ad basin in lacinias 5 lineares diviso flore 2–3 mm. fructu ad 4·5 mm. accrescentibus; *corollae* tubo gracili 5 mm. extra subglabro, lobis triangularibus subacutis 1–1·5 mm. extra dense barbatis; *bacca* ellipsoidea hispida calycis limbo persistente coronata.
COLOMBIA. Tolima: San Augustin, fl. and fr. March, *Sprague* 304. Also collected by *Triana* 1708; Ocaña, *Purdie; Kalbreyer* 1055.
This species bears a superficial resemblance to *P. trichocephala,* Poepp. et Endl., but there is a fundamental difference in the elongated calyx-segments of the present species, and the leaf-indumentum is quite distinct. The nearest affinity seems to be with the Brazilian *P. horridula,* Muell. Arg., which has a 2-3-flowered inflorescence, and differently-shaped leaves and stipules.

Psychotria bertieroides, *Wernham;* affinis *P. flexuosae,* K. Schum., a qua corolla distinguitur.
Frutex glaber ramulis quadrangularibus; *foliis* ellipticis 16 cm. × 6 cm. ad 22 cm. × 9 cm. utrinque angustatis apice acutis, petiolo 2–2·5 cm. longo venis secundariis utrinque 10; *stipulis* binis infra in vagina ad circiter 2·5 mm. alta connatis supra in aristis duabus rigidescentibus 3 mm. longis 3·5 mm. distantibus productis; *inflorescentia* thyrsoidea laxa circiter 11 cm. × 6 cm., pedunculo 6–7 cm. longo, cymulis dichotomis subunilateralibus, floribus 4–meris subsecundis distantibus sessilibus 4–5 mm. longis; *bracteis* obsoletis; *calyce* minimo puberulo minute dentato; *corolla* extra minutissime sparsim pubescente vel glabrescente insuper infundibulari lobis oblongis patentibus obtusis vix 1 mm. longis; *bacca* pisiformi costata glabra.

Colombia. Caquetá District: Mocoa, fl. and fr. **May**, *Sprague* 386.

Recalls *Bertiera parviflora* in the inflorescence and leaf-shape. The nearest species is, perhaps, *P. flexuosa*, K. Schum, but the two are readily distinguished by the characters of the corolla.

Psychotria tolimensis, *Wernham;* affinis *P. anomothyrsae*, K. Schum., a qua inflorescentia differt.

Frutex glaber ramulis subfistulosis; *foliis* oblongo-lanceolatis vel oblanceolatis ad circiter 23 cm. × 6–6·5 cm. apicem subacutum versus leniter acuminatis basi in petiolum subalatum 2–3 cm. longum angustatis; *stipulis* parvis triangularibus caducissimis; *inflorescentia* thyrsoidea laxa circiter 3 cm. × 2·5 cm., pedunculo 3–3·5 cm. axillari ramulis complanatis bracteis inconspicuis; *calycis* minimi limbo subintegro; *corolla* glabra alba angusta superne vix ampliata 5–6 mm. longa.

Colombia. Tolima: Pitalito, fl. March, *Sprague* 237. Also collected by *Triana* 1707.

Near *P. anomothyrsa*, K. Schum, from which it differs in the extent of the inflorescence.

Psychotria cabuyarensis, *Wernham;* foliis magnis obovatis, stipulis rotundatis conspicue acuminatis, inflorescentia magna diffusa facile distinguitur.

Arbor 3 m. alta, glabra; *foliis* obovatis 26–31 cm. × 9–12 cm. apicem subacutum versus parum acuminatis desuper in basin leniter angustatis petiolo brevissimo vel obsoleto venis secundariis utrinque circiter 15 conspicuis; *stipulis* integris late ovatis 1·7 cm. × 1·7 cm. caudato-acuminatis acutissimis; *inflorescentia* maxima thyrsoidea laxa ramis divaricatis in fructu ad 13 cm. × 20 cm. accrescente pedunculo valido 19–20 cm. longo; *bracteis* minutiusculis caducis; *floribus* albo-viridibus; *bacca* glabra ovoidea 8–9 mm. × 3–4 mm.

Colombia. Cabuyaro, Rio Meta, in forest south of river, fr. Jan. *Sprague* 154. Collected also by *Barclay* 739, on loam soil in moist woods of St. Francis Esmeraldas.

A very distinct species, readily identified by the large obovate leaves, the broad, rounded stipules with sharply-marked acumen, and the very extensive and diffuse inflorescence.

Psychotria alibertioides, *Wernham;* affinis *P. granadensi*, Benth., a qua calyce multo majore distinguitur.

Frutex glaber ramulis subteretibus validis; *foliis* pergamentaceis obovatis ad 14–15 cm. × 6·5–7 cm. breviter acuminatis obtusis basi acutis petiolo valido 5–8 mm. longo supra demum argenteo-griseis venis secundariis utrinque 9–12 subtus prominentibus; *stipulis* oblongis apice rotundatis circiter 1 cm. × 3·5 mm., parte inferiore paullum persistente mox tamen deciduis; *inflorescentia* umbellata 2–3-chotoma 7–10-flora pedunculo brevi tota vix 3 cm. × 2·5 cm.; *calycis* limbo circiter 2·5 mm. longo 6 mm. lato obscuriuscule dentato; *corollae* albae glabrae tubo late cylindraceo 1·3 cm. × 4·5 mm. (ore) lobis 5 oblongis obtusis 4·5 mm. × 1·8 mm.

Colombia. Caquetá District: San José, R. Putumayo, fl. Aug. *Sprague* 602.

Near *P. granadensis*, Benth., but the calyx in our species is much larger.

Palicourea crocea, *Roem. et Schult.* Syst. v. 193.
Colombia. Tolima: San Augustin, fl. and fr. March, *Sprague* 282. Flowers orange.
Distrib. Tropical America and Paraguay.

Palicourea augustifolia, *H. B. et K.* Nov. Gen. et Sp., iii. 367.
Colombia. Between Villavicencio and Bogotá, *Sprague.*
Distrib. Colombia and Venezuela (banks of Orinoco and Rio Negro).

Palicourea caerulea, *Roem. et Schult.* Syst. v. 194.
Colombia. San Martin District: Villavicencio, fl. and fr. Jan. *Sprague* 90.
Distrib. Western Tropical South America.

Palicourea dorantha, *Wernham;* affinis *P. calycinae,* Benth., a qua stipulis et inflorescentiae magnitudine differt.
Arbor 6 m. alta, caule 6–7·5 cm. diametro; *foliis* ellipticis utrinque breviter acuminatis subacutis circiter 20 cm.×8·5 cm. utrinque nisi subtus in venis sparsissime pilosis glabris venis secundariis utrinque circiter 12–15 subtus prominentibus petiolo glabro ad 3 cm. longo; *stipulis* in vagina 1 cm. alta connatis, partibus liberis 1·5 cm. vel longioribus; *inflorescentia* laxa thyrsoidea circiter 18 cm.×12 cm., pedunculo valido glabro 7–8 cm. longo; *bracteis* parvis ad 8 mm. × 3 mm. oblongo-lanceolatis; *calycis* segmentis latis rotundatis circiter 2 mm.×2·5 mm. imbricatis; *corolla* inter maximas infundibulari-cylindracea fere 2 cm. longa, ore 7 mm. lata extra dense velutine tomentosa, lobis brevibus latis rotundis.
Colombia. Eastern Cordilleras, between Pitalito (Tolima) and Mocoa (Caquetá District), fl. April, *Sprague* 345.
The nearest ally seems to be *Palicourea calycina,* Benth., but the present species is distinct in the character of the stipules and size of the inflorescence.

Mapouria alba, *Muell. Arg.* in Flora, 1876, 458.
Colombia. Tolima: San Augustin, fl. and fr. March, *Sprague* 307. A small tree, 4·5–6 m., with whitish flowers and red fruits.
Distrib. Western Tropical South America, Brazil, and Paraguay.

Mapouria micrantha, *Wernham,* comb. nov. *Psychotria micrantha,* H. B. et K. Nov. Gen. Sp. Pl. iii. 363, t. 284 (1818).
Colombia. Caquetá District: Mocoa, fl. and fr. May, *Sprague* 400.
Distrib. Western Tropical South America.

Emmeorhiza umbellata, *K. Schum.* in Fl. Bras. VI. vi. 408. *Endlichera umbellata,* K. Schum., l.c. 38; necnon synonyma alia.
Colombia. Tolima: San Augustin, fl. and fr. March, *Sprague* 321.
Distrib. Widely distributed over the tropics of South America and extending into Paraguay.

XI.—SARCANTHUS OXYPHYLLUS.

R. A. Rolfe.

The identity of *Sarcanthus oxyphyllus*, Wall., has never been satisfactorily established, though the late Sir J. D. Hooker referred to it a specimen collected at Moulmein by Parish. He, however, mentioned a so-named drawing at Calcutta, which to him suggested some misapplication of the name by Lindley or Wallich. Owing to the necessity of identifying the plant, the matter was referred to Major A. T. Gage, I.M.S., Superintendent of the Royal Botanic Garden, Calcutta, who informs us that there is no original Wallichian drawing at Calcutta, but there is a record in a catalogue of the Calcutta Botanic Garden which enables the plant to be identified.

Lindley, in 1840 (Bot. Reg. xxvi. Misc. p. 58), mentions *Sarcanthus oxyphyllus*, Wallich MSS., as follows: "This plant, which has been lately received from Calcutta by several persons, has flowered in the garden of the Horticultural Society, and proves to be nothing more than a narrow-leaved variety of *Sarcanthus rostratus*, a species of no beauty, long since introduced by the Horticultural Society from China." The habitat of the plant is not stated, and, unfortunately, the specimen alluded to is not preserved in Lindley's Herbarium. Reichenbach, however, who in 1855 obtained a specimen from Consul Schiller, which the latter had received direct from Calcutta (Otto and Dietr. Allg. Gartenz. xxiii. p. 331), indicated the plant as distinct from *S. rostratus*, Lindl., and it is now evident that this view is correct.

The only specimen of *S. oxyphyllus* cited by Sir J. D. Hooker (Fl. Brit. Ind. vi. p. 70) is Moulmein, Parish, a plant collected long after Wallich's time, to which alone his remark applies that the species is very nearly allied to *S. pugioniformis*, Reichb. f. He also cites, somewhat doubtfully, as synonymous *Cleisostoma subulatum*, Blume, and *Angraecum pugioniforme*, Klotzsch, the former a Javan plant, afterwards called *Sarcanthus subulatus*, Reichb. f., the latter from Venezuela, now known as *Campylocentrum pugioniforme*, Rolfe.

The Calcutta drawing above-mentioned is reproduced by Sir J. D. Hooker under the name of *Sarcanthus secundus*, Griff., in Ann. R. Bot. Gard. Calc. v. p. 51, t. 77, and on p. 52 the note occurs: "The drawing here reproduced is inscribed '*Sarcanthus oxyphyllus*, Wall.' in Wallich's handwriting; to which is added 'Duphla Hills, Mr. Lister, Fld., June, 1875' (it is 1878 on the Kew copy)." The phrase "in Wallich's handwriting" is obviously incorrect, and is probably that of Dr. King.

Wallich's Herbarium, now at Kew, throws no light on the matter, though his number 7321 includes specimens of *Sarcanthus secundus*, Griff. This number comprises three species, of as many different genera: (1) the type of *Micropera pallida*, Lindl. (Gen. & Sp. Orch. p. 219), collected in E. Sylhet by F. de Silva; (2) *Sarcanthus secundus*, Griff., collected in Sylhet in August, 1831, by W. Gomez (the other name cited by Wallich); and (3) *Saccolabium ramosum*, Lindl., collected in the Loam Mountains in May, 1830 (collector not stated). The latter is not cited by

Wallich (Cat. n. 7321), and may not have been included by him, though both it and a second specimen of *Sarcanthus secundus* from another source bear the number 7321 on the sheet (not on the labels).

J. J. Smith (Orch. Jav. p. 604) cites *Sarcanthus secundus*, Griff., as a synonym of *S. subulatus*, Reichb. f., under which he includes the Indian plant, which is now considered to be quite distinct.

Lastly, Ridley, who in his Mat. Fl. Mal. Penins. i. p. 168, transfers *Sarcanthus secundus* to *Saccolabium*, also applies the name to the Malayan plant, which he cites as occurring from Assam to Borneo, but he expressly excludes Ann. R. Bot. Gard. Calc. viii. p. 241, t. 331, which is true *Sarcanthus secundus*, Griff. The latter shows how completely the name has been confused.

We now return to the original *Sarcanthus oxyphyllus*, Wall., and the record kindly furnished by Major A. T. Gage. According to a catalogue of the Hon. East India Company's Botanic Garden at Calcutta, 1794-1840, vol. iii. p. 1985, Wallich based his *S. oxyphyllus* on "Khasia, W. Gomez, 1821, and Assam, W. Griffith," thus confirming the record that it is identical with the later *S. secundus*, Griff. King and Pantling (Ann. R. Bot. Gard. Calc. viii. p. 241, t. 321) adopt the later name, adding, however, "Griffith's name is inappropriate, as the flowers are not secund," and although Griffith gave the name in reference to the leaves the character does not always apply, and the clearing up of the confusion suggests the desirability of returning to the earlier and fully appropriate name. In view of the above facts the suggestion of some misapplication of the name *S. oxyphyllus* by Lindley or Wallich is seen to be untenable.

The species of *Sarcanthus* closely allied to *S. oxyphyllus* form a natural group, and are as follows:—

S. oxyphyllus, *Wall. ex Lindl.* Bot. Reg. xxv. Misc. p. 58 (1840); Reichb. f. in Otto & Dietr. Allg. Gartenz. xxiii. p. 331 (1855) (not of Hook. f.). *S. secundus*, Griff. Notul. iii. p. 362 (1851); Ic. Pl. Asiat. t. 336; Hook. f. in Ann. R. Bot. Gard. Calc. v. p. 51, t. 77; King & Pantl. l.c. viii. p. 241, t. 321. *Micropera pallida*, Wall. Cat., n. 7321 (1828), in part (not of Lindl.).—Native of Sylhet, Assam, Khasia, Chittagong, Duphla Hills and Sikkim.

S. peninsularis, *Dalz.* in Hook. Kew Journ. Bot. iii. p. 343 (1851). *S. pauciflorus*, Wight Ic. t. 1747 (1852). *Saccolabium acuminatum*, Thwaites Enum. Pl. Ceyl. p. 304 (1861).—Native of the Deccan Peninsula, from the Concan to Travancore, and Ceylon, in the Saffragam district.

S. subulatus, *Reichb. f.* in Bonplandia, v. p. 41 (1857); J. J. Sm. Orch. Jav. p. 604. *S. pugioniformis*, Reichb. f. in Otto & Dietr. Allg. Gartenz. xxiv. p. 219 (1856), excl. syn. *S. oxyphyllus*, Hook. f. Fl. Brit. Ind. vi. p. 70 (1890) (not of Wall.). *Saccolabium secundum*, Ridl. Mat. Fl. Mal. Penins. i. p. 168 (1907). *Cleisostoma subulatum*, Blume Bijdr. p. 363 (1825).—

Native of Moulmein, Cochin China, the Malay Peninsula, Java, Sumatra and Borneo.

S. dealbatus, *Reichb. f.* in Walp. Ann. vi. p. 892 (1864). *Cleisostoma dealbatum*, Lindl. Bot. Reg. xxix. Misc. p. 5 (1843). —Native of the Philippines.

It may be added that there is a slight doubt as to whether the references cited under *Sarcanthus subulatus* all belong to the same species. Reichenbach considered the Javan *S. subulatus* as distinct from *S. pugioniformis*, of which latter the habitat was not known, though he cited the Venezuelan *Angraecum pugioniforme*, Klotzsch, which is not a *Sarcanthus*, as synonymous. There is, however, in Lindley's Herbarium a dried specimen and coloured drawing from "Borneo, J. Moon, 8 Feb., 1847," which Lindley has labelled "*Cleisostoma subulatum*, Blume," to which Reichenbach has added, "vid. *Sarcanth. pugionif.*, Rb.f." I have not seen the Javan plant, but J. J. Smith indicates it as identical with the Bornean one.

XII.—FUNGI EXOTICI: XVII.

All the specimens described were collected by Mrs. Burkill in the Botanic Gardens, Singapore, and were accompanied by coloured drawings and notes prepared by the collector.

The genus *Boletus* appears to be especially well represented, 24 new species have already been described from the Singapore Gardens, and there is evidence of the existence of more, which can be dealt with on some future occasion when better material may be available.

Agaricaceae.

Lepiota albida, *Massee.*

Pileus membranaceus, primo subglobosus dein explanatus, umbonatus, margine striatulus, albidus, 3–4 cm. latus. *Lamellae* liberae, confertiusculae, albidae. *Stipes* sursum attenuatus, fistulosus, candidus, glaberrimus, albidus, facile a pileo secedens, 4–6 cm. longus, 4–5 mm. crassus; annulus adnatus, persistens. *Sporae* ellipticae, hyalinae, 6 × 3·5 μ.

Singapore. Among nests of black Termites, *E. M. Burkill* 219.

Differs from *L. erminea* in the persistent ring and smaller spores.

Schulzeria pellucida, *Massee.*

Pileus tenuissimus, translucens, sulcato-plicatus, opalinus, pulvere sulfureo adspersus, 3–4 cm. diametro. *Lamellae* liberae, subdistantes, latae, antice acutae, albidae. *Stipes* sursum attenuatus, basi inflatus, fistulosus, pallidus, squamulis sulfureis ornatus, 8–12 cm. longus, 3–4 mm. crassus. *Sporae* oblique ellipsoidae, hyalinae, laeves, utrinque apiculatae, 12–14 × 9–10 μ.

Singapore. Under trees amongst fallen leaves, *E. M. Burkill* 101.

The general aspect is that of a *Bolbitius*, but the spores are colourless, and the gills free from the stem.

Collybia elata, *Massee.*

Pileus hemispherico-explanatus, glaber, in sicco rugulosus, margine acuto integro, flavo-brunneus, umbone versus saturatior, 5–6 cm. latus. *Lamellae* adnexae, antice rotundatae, confertae, albidae. *Stipes* rectus, sursum gradatim attenuatus, fistulosus, extus fibrillosus, pallidus, 8–10 cm. longus, 0·8–1 cm. crassus. *Sporae* globosae, hyalinae, basi apiculatae, 7–8 μ diametro.

SINGAPORE. On the ground in the jungle, *E. M. Burkill* 150.

C. elata is allied to *C. radicata*, but may be distinguished by the globose spores, and the absence of a long rooting base to the stem.

Clitocybe carnosa, *Massee.*

Pileus valde carnosus, convexus, sericeo-fibrillosus, concentrice squamulosus, aetate plus vel minus rimosus, albidus, 4–5 cm. latus. *Lamellae* angustissimae, confertae, utrinque acutae, decurrentes, acie integerrimae, pallidae. *Stipes* teres, tenuis, laevissimus, basi subbulbosus, solidus, pileo concolor, 3–4 cm. longus, 4–5 mm. crassus. *Sporae* oblique ellipsoideae, hyalinae, 5 × 3 μ.

SINGAPORE. On the ground, *E. M. Burkill* 82.

This species is remarkable for the thick flesh of the pileus, which remains convex when the plant is quite mature. Allied to *C. cerussata.*

Russula aeruginosa, *Massee.*

Pileus explanato-expansus, centro subdepressus, carnosus, aeruginosus, margine versus dilutior, cute non difficile separanda, 8–10 cm. latus. *Lamellae* latiusculae, confertae, antice rotundatae, albidae. *Stipes* laevis, glaber, aequalis, candidus, 8–10 cm. longus, 0·8 × 1·2 cm. crassus. *Sporae* globosae, hyalinae, 6–7 diametro.

SINGAPORE. On the ground in the jungle, *E. M. Burkill* 63.

Allied to *R. olivacea*, but distinguished by the crowded gills and the readily separable cuticle.

Russula fragilis, *Fries.*

SINGAPORE. On the ground in the jungle, *E. M. Burkill* 232.

Lactarius bicolor, *Massee.*

Pileus plano-depressus, subcarnosus, obscure brunneus, margine repandus, 4–5 cm. latus. *Lamellae* ventricosae, distantes, postice attenuatae, dente majusculo decurrentes, acie integrae, griseae. *Stipes* teres, glaber, pileo concolor, 5–6 cm. longus, 6–8 mm. crassus. *Sporae* hyalinae, globosae, asperulae, 7–8 μ diametro.

SINGAPORE. Among fallen leaves in the jungle, *E. M. Burkill* 73.

In an accompanying note this fungus is said to be full of latex, but the colour and taste are not noted. Allied to *L. subdulcis*, Fr.

Hygrophorus chlorophanus, *Fries.*

SINGAPORE. On the ground in the jungle, *E. M. Burkill* 260.

Marasmius lanatus, *Massee.*

Pileus resupinatus, minutissimus, orbicularis, cupulatus, membranaceus, dorsi centro adfixus, albido-cervinus, floccoso-lanatus,

margine integro, involutus, 2–3 mm. latus. *Lamellae* e centro radiantes, angustae, brunneo-tinctae. *Sporae* ellipsoideae, hyalinae, 4 × 3 μ.

SINGAPORE. On dead, fallen leaves of *Oncosperma*, *E. M. Burkill* 86.

Allied to *Pleurotus microscopicus*, Speg., but differs in having a woolly pileus and coloured gills.

Entoloma Burkillae, *Massee.*

Pileus carnosus, orbiculatus, glaber, laevis, margine subinvolutus, integer, leniter undulatus, toto intense coeruleus. *Lamellae* confertae, latiusculae, sinuatae, primo albidae, dein pallide incarnatae. *Stipes* rectus, teres, solidus, extus fibrosus, albidus vel pallide griseus. *Sporae* subglobosae, nodulosae, incarnatae, 8 μ diametro.

SINGAPORE. On the ground in the jungle, *E. M. Burkill* 152.

A very beautiful fungus, belonging to a well-marked group of species characterised by the presence of clear blue tints. Most nearly allied to *E. ardosiacum*.

Inocybe umbrina, *Massee.*

Pileus hemisphaericus, dein explanatus, subumbonatus, sericeo-fibrillosus, hic inde rimosus, umbrinus, versus umbonem obscurior, 3–5 cm. latus. *Lamellae* adnatae, confertae, utrinque acutatae, pallide carneo-griseae. *Stipes* sursum attenuatus, solidus, fibrillosus, pileo concolor. *Sporae* ellipsoideae, laeve, pallide umbrinae, 8–10 × 6–7 μ.

SINGAPORE. On a clay bank, *E. M. Burkill* 250.

This species belongs to the *Rimosae* section of *Inocybe*, and is mostly allied to *I. rimosa*, from which it differs in the umber-coloured cap and broadly elliptical spores.

Pholiota hepatica, *Massee.*

Pileus tenuis, applanatus, centro subumbonatus, margine rectus, laevis, glaberrimus, hepaticolor, medio obscurior, 5–6 cm. latus. *Lamellae* postice attenuatae, confertae, griseo-incarnatae, acie integrae. *Stipes* teres, rectus, fusco-fuligineus, extus fibrillosus, 5–6 cm. longus. *Sporae* ellipsoideae, inferne lateraliter acutatae, lilacino-tinctae, 5 × 3 μ.

SINGAPORE. On the ground, *E. M. Burkill* 204.

P. hepatica approaches *P. erebia* in general structure.

Flammula bella, *Massee.*

Pileus hemispherico-explanatus, margine regulari vel plus minusve undulato, pulchre fulvo-aurantiacus, squamulosus, 3–5 cm. latus. *Lamellae* confertae, angustae, utrinque acutatae, postice dente decurrentes, flavae. *Stipes* teres, solidus, extus fibrillosus, pallide lutescenti-fulvescentes, 4 cm. longus, 0·8–1 cm. crassus. *Sporae* oblongo-ellipsoideae, basi oblique apiculatae, pallide ferrugineae, 10 × 5 μ.

SINGAPORE. On a path in the jungle, *E. M. Burkill* 134.

A very beautiful fungus with a tawny-orange cap and clear yellow gills. Allied to *F. sapinea*, from which it differs in the squamulose cap and narrow, crowded gills.

Agaricus tenuiceps, *Massee.*
Pileus tenuiter carnoso-membranaceus, hemispherico-expansus, gibbosus, fibrillosus, pallide umbrinus, centrum versus fuscescens, margine subinvolutus, 7–10 cm. latus. *Lamellae* liberae, angustae, confertae, demum umbrinae. *Stipes* erectus, solidus, extus minutissime fibrillosus, pallidus, 7–10 cm. longus, 0·8–1·2 cm. crassus; annulus membranaceus, albidus, persistens. *Sporae* ellipsoideae, umbrinae, 7 × 4 μ.
SINGAPORE. On the ground under trees, *E. M. Burkill* 267.
Differs from *A. silvaticus* in the hollow stem and narrow, crowded gills. In all probability edible.

Stropharia minima, *Massee.*
Pileus hemisphaericus, tenuis, margine acuto, glaber, flavo-cinerascens, 1·5–2 cm. latus. *Lamellae* confertae, latae, antice acutae, postice subdecurrentes, acie integrae, in senectute umbrinae. *Stipes* teres, fistulosis, glaber, pileo concolor, 3 cm. longus, 2–3 mm. crassus, ad tertiam inferam partem subannulatim squamulosus. *Sporae* oblique ellipsoideae, saturatae fusco-brunneae, 6 × 3 μ.
SINGAPORE. On horse dung, *E. M. Burkill* 266.
Resembles *S. semiglobata* in miniature.

Hypholoma sublateritium, *Schaeff.*
SINGAPORE. On and around trunks, *E. M. Burkill* 127.

Coprinus plicatilis, *Fr.*
SINGAPORE. On the ground in the jungle, *E. M. Burkill* 70.

Coprinus niveus, *Fr.*
SINGAPORE. On dung, *E. M. Burkill* 71.

AURICULARIACEAE.

Auricularia indica, *Massee.*
Pileus carnosus, gelatinosus, flaccidus, dimidiato-horizontalis, sessilis, rufescenti-brunneus, basin versus minute densique pruinosus, 3–4 cm. latus. *Hymenium* ceraceo-gelatinosum, irregulariter venosa vel porose effiguratum. *Sporae* ellipsoideae, hyalinae, 7 × 5 μ.
SINGAPORE. On a dead log, *E. M. Burkill* 210.

Hirneola auricula-judae, *Berk.*
SINGAPORE. On dead wood, *E. M. Burkill* 191.

POLYPORACEAE.

Boletus indecorus, *Massee.*
Pileus pulvinatus, siccus, glaber, primitus levis dein rimoso-areolatus, umbrinus, 4–5 cm. latus. *Tubuli* stipiti adnati, curti, flavo-virentes; pori angulosi, minuti, aurei. *Stipes* solidus, deorsum attenuatus, pileo concolor, 5–6 longus, 1 cm. crassus. *Sporae* fusiformae, flavo-virides, 10 × 4·5 μ. *Caro* albida, fractu roseo-tincta, 1 cm. crassa, compacta.
SINGAPORE. On the roots of trees in the jungle, *E. M. Burkill* 66.

A dull-coloured, inconspicuous little species, allied to *B. pachycephalus*, Mass., differing in the glabrous pileus, stem narrowed at the base, and in the change in colour of the flesh when exposed to the air.

Boletus craspedius, *Massee.*

Pileus globoso-pulvinatus dein expansus, carnosus, glaber, nigro-brunneus centro saturatiore, 7–8 cm. latus. *Tubuli* stipiti adnati, brevissimi, flavo-virentes; pori minuti, rotundati, coccineo-flavescentes. *Stipes* solidus, teres, glaber, coccineus, 5 cm. longus, 2·5 cm. crassus. *Sporae* ellipsoideae flavo-tinctae, 10–11 × 5 μ. *Caro* compacta, flava, fractu virescens.

SINGAPORE. On the ground, *E. M. Burkill* 137.

Stature and general appearance *of B. luridus.* Differing in the cylindrical stem, larger spores, and in the flesh changing to green when broken.

XIII.—A NEW COVER-CROP.

(*Dolichos Hosei*).

W. G. CRAIB.

Last year Mr. E. Hose* drew attention to a cover crop which had proved highly satisfactory with him in Sarawak. In the same article there was an editorial note to the effect that Mr. Hose had sent cuttings which would be tried in the Kuala Lumpur Experimental Plantation. In response to an inquiry from Kew the Director of Agriculture, Kuala Lumpur, forwarded specimens for identification. The specimens could not be matched in the Kew herbarium, and as they did not appear to agree with any described species of *Dolichos* they have been made the type of a new species—*D. Hosei*—named after the discoverer.

In the course of his article quoted above, Mr. Hose says that for five years he has been experimenting with various leguminous plants as cover crops. His experience demonstrated to him that what was required was a low-growing leguminous plant which could be dug into the soil and which would reproduce itself in time to check the growth of weeds. For three years he had been planting *D. Hosei* with rubber and had then 200 acres planted with it—the result being that it had "proved itself in every way a success." He describes the plant, which he says is indigenous in Sarawak, as forming a thick level mass about six inches thick on the ground; it will grow on almost any soil, but a light one for preference, and in six months after planting should prevent all wash, if planted three feet apart. The trees, he adds, are ring-weeded monthly. It "grows readily from cuttings but seeds are difficult to procure," a fact which has been corroborated during the Kuala Lumpur experiments.

Dolichos Hosei, *Craib* [Leguminosae-Phaseoleae]; a *D. bifloro,* Linn., calycis lobis brevibus recedit.

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* Notes on a Creeping Bean—Agric. Bull. Fed. Mal. States, vol. i. p. 276.

Caules graciles, primo pilis deflexis densius tecti, mox pilis paucis plerumque divergentibus instructi, nodis radicantes. *Folia* trifoliolata, petiolo communi ad 5 cm. longo supra canaliculato pilis deflexis subaureis parce instructo suffulta; stipulae lanceolatae, acutissimae, ad 6 mm. longae, infra insertionem inaequaliter bilobae, nervosae, dorso margineque pilis longiusculis sparse instructae; foliola lateralia inaequilatera, latere altero dimidiatim ovata, altero dimidiatim lanceolata, apice plerumque acuta, mucronulata, basi latere altero rotundata, altero cuneata vel cuneato-rotundata, ad 3·5 cm. longa et 2 cm. lata, terminalia a lateralibus usque ad 1 cm. distantia, plerumque elliptico-rhomboidea, vel angustius elliptico-rhomboidea, lateralibus subaequalia vel iis paulo majora, omnia chartacea vel membranaceo-chartacea, subtus pallidiora, pagina utraque pilis longiusculis sparse instructa sed marginem versus pilis brevioribus densius ornata, e basi trinervata, nervis lateralibus utrinque 2–3 supra conspicuis subtus prominulis, nervis transversis subtus uti reticulatione gracili conspicuis, petiolulis circiter 2 mm. longis pilis longiusculis divaricatis instructis suffulta; stipellae circiter 2 mm. longae. *Racemi* abbreviati, pauciflori, pedunculo communi 1·5–5·5 cm. longo superne praecipue pilis reflexis instructo suffulti; pedicelli 2 mm. longi, puberuli; bracteolae binae, 1·25 mm. longae. *Calycis* tubus circiter 2 mm. longus; lobi laterales lobo inferiori subaequales, deltoidei vel anguste deltoidei, acutiusculi, circiter 1 mm. longi; lobi duo supremi in unum aliis subaequilongum et circiter 2 mm. latum connati. *Vexillum* lineatum, circiter 5 mm. longum et 6 mm. latum, ungui vix 2 mm. longo; alae 6 mm. longae, 3 mm. latae, basi auriculatae, ungui 1·75 mm. longo; carina 6·5 mm. (ungui 2 mm. longo incluso) alta. *Ovarium* 3 mm. altum, sericeum; stylus basi gracilis, superne facie inferiore albo-barbatus. *Fructus* ad 4·5 mm. diametro.

Sarawak. Described from specimens cultivated at Kuala Lumpur from cuttings supplied by Mr. Hose, Sarawak.

XIV.—THE GENUS MORENIA.

C. H. Wright.

The genus *Morenia* was founded in 1794 by Ruiz and Pavon (Prodr. Fl. Peruv. et Chil. p. 150, t. 32), and named in honour of Dr. D. Gabriel Moreno, a medical man of Lima. No specific name was given in that publication, but in 1798 in their Systema Veg. Fl. Peruv. p. 299, it was called *M. fragrans*, and was said to have been found at Muña, Peru, where it was known as the "Siasia." The claim of *Morenia* to rank as a distinct genus has been upheld by several authors, amongst whom are Martius, H. Wendland, Drude, Karsten and Trail. Bentham and Hooker, in their Genera Plantarum, vol. iii. p. 911, united it and other genera with *Chamaedorea*, Willd. (Sp. Plant. vol. iv. pp. 638 and 800, 1805), which now contains about 60 species, most of which come

from Central America, while those referred to *Morenia* are Andine, except *M. integrifolia*, a native of Western Brazil. The original species of *Chamaedorea* was *C. gracilis*, Willd. (l.c. p. 800), which included *Borassus pinnatifrons*, Jacq. Hort. Schoenbr. ii. p. 65, tt. 247, 248.

Drude in Engler und Prantl's Natürl. Pflanzenfam. ii. III. 62, separates the two above mentioned genera thus:—

Chamaedorea. Male flower: Calyx annular or saucer-shaped. Petals at first connected at the apex. Stamens 6, usually included in the corolla.

Morenia. Male flower: Calyx 3-toothed. Petals broadly oval, acuminate, stellately spreading. Stamens 6, erect. [Male spadices usually whorled.]

The species of *Morenia* can be distinguished as follows:—

Leaves simply bilobed ... ... 1. *M. integrifolia*, Trail
Leaves pinnatisect:
  Male inflorescence very dense:
    Leaf-segments lanceolate ... 2. *M. Lindeniana*, H. Wendl.
    Leaf-segments elliptic-lanceolate ... ... 3. *M. fragrans*, Ruiz et Pavon
  Male inflorescence lax:
    Leaf-segments straight.
      Stamens of equal length. 4. *M. corallina*, Karst.
    Leaf-segments sigmoid.
      Outer stamens longer than the inner ... ... 5. *M. Poeppigiana*, Mart.

1. **M. integrifolia,** *Trail* in Journ. Bot. xiv. (1876), p. 331; *Drude* in Mart. Fl. Bras. iii. II. p. 525. Western Equatorial Brazil.
   Var. **nigricans,** *Trail*, l.c. Western Equatorial Brazil.

2. **M. Lindeniana,** *H. Wendl.* in Bot. Zeit. xvii. (1859), p. 17; *O. Drude* in Mart. Fl. Bras. iii. II. p. 526. *Chamaedorea Lindeniana*, H. Wendl. in Otto & Dietr. Allg. Gartenz. xxi. (1853), p. 139. Andes of Colombia.

3. **M. fragrans,** *Ruiz et Pavon*, Syst. Veg. Fl. Peruv. p. 299; Mart. Hist. Nat. Palm. iii. p. 162, et Palm. Orbign. p. 7, tt. 3, 16; Bot. Mag t. 5492 (excl. syns., *M. Lindeniana* and *Chamaedorea Lindeniana*); Drude in Mart. Fl. Bras. iii. II. p. 525. Peru and Bolivia.
   This is not the same as *Chamaedorea fragrans*, Mart. (Hist. Nat. Palm. ii. p. 4, t. 3, figs. 1–2), which has bilobed leaves.

4. **M. corallina,** *Karst.* in Linnaea, xxviii. (1856), p. 274, and Fl. Columb. ii. p. 135, t. 171; Bot. Mag. t. 8527. Andes of Colombia.

5. **M. Poeppigiana,** *Mart.* Hist. Nat. Palm. iii. p. 161, tt. 140, 141; *Spruce* in Journ. Linn. Soc. xi. p. 123; *O. Drude* in Mart. Fl. Bras. iii. II. 526. Peru.

Imperfectly Known Species.

M. corallocarpa, Hort. ex Wendl. Ind. Palm. p. 29 (nomen). Colombia?

M.? pauciflora, Drude in Mart. Fl. Bras. iii. II. p. 526. *Chamaedorea pauciflora*, Mart. Hist. Nat. Palm. ii. p. 5. Brazil.

Excluded Species.

M. Chonta, Phil. in Bot. Zeit. xiv. 1856, p. 648, et in Anal. Univ. Chil. 1856, p. 168 = *Juania australis*, Drude. Juan Fernandez.

M. Ernesti-Augusti, H. Wendl. in Otto & Dietr. Allg. Gartenz. xxi. (1853), p. 3 = *Chamaedorea Ernesti-Augusti*, H. Wendl. Mexico.

M. oblongata, H. Wendl. in Otto & Dietr. Allg. Gartenz. xxi. (1853), p. 3 = *Chamaedorea Sartorii*, Liebm. Mexico.

XV.—DIAGNOSES AFRICANAE: LVII.

1481. **Millettia** (**Efulgentes**) **Lane-Poolei,** *Dunn* [Leguminosae-Galegeae]; *M. rhodanthae*, Baill affinis, sed calycibus et foliolis glabris et foliolorum basi rotundata distincta.

Arbor parva, ramulis laevibus. *Folia* 4-juga, 9–11 cm. longa, petiolo 8–plo longiora, rachi glabra gracili; stipulae ovatae, scariosae, striatae, 3 mm. longae; foliola superiora lateralia oblongo-lanceolata, apice acuminata, basi rotundata, membranacea, glabra, 3 cm. longa, venis marginem appropinquantibus 7–paribus inconspicuis; petioluli 2 mm. longi; stipellae setaceae, 2 mm. longae, persistentes. *Paniculae* racemiformes axillares, 4–6 cm. longae, pedunculo subnullo, rachi puberula; nodi floriferi pauciflori, 3–4 mm. longi. *Flores* approximati, 1·1 cm. longi; pedicelli calyce paullo breviores; bracteae bracteolaeque 1–2 mm. longae, deciduae. *Calyx* campanulatus, 4 mm. longus, praeter marginem puberulam glaber; dentes tubo 6-plo breviores, late triangulares. *Petala* glabra; vexilli lamina ovato-rotundata, basi subcordata, medio valde bicallosa; alae ovatae, basi breviter sagittatae; carinae petala oblonga, sub-acuta, basi ut alae. *Stamina* 10, vexillari basi soluto et ibi saepe callis vexilli retento. *Discus* lineatus, calyci adnatus. *Ovarium* lineare, puberulum, 8–ovulatum. *Legumen* non visum.

Tropical West Africa. Sierra Leone: Keunema (flowering in March), *C. E. Lane-Poole* 140.

1482. **Senecio Conrathii,** *N. E. Brown* [Compositae-Senecioneae]; affinis *S. serrae*, Sond., corymbi ramis multo longioribus et capitulis majoribus bene distinguitur.

Herba 60–70 cm. alta. *Caulis* simplex, erecta, basi 5 mm. crassus, striatus, glaber. *Folia* lineari-lanceolata, acuta, calloso-serrata, glabra, 0·8–1·3 cm. lata, inferiora 15–19 cm. longa, petiolata, superiora gradatim minora, sessilia. *Corymbus* circa 10 cm. diametro, glaber, ramis inferioribus 15–24 cm. longis erectis. *Bracteae* 1–4 cm. longae, e basi 1·5–4 mm. lato subulato-

attenuatae, glabrae. *Capitula* radiata, lutea, disco 1·2–1·3 cm. diametro; involucri segmenta subtriseriata, subaequalia, 7–8 mm. longa. linearia, acuta, glabra; ligulae 0·8–1 cm. longae, 4 mm. latae. *Pappi* setae copiosae, albae.

South Africa. Transvaal: near Modderfontein, *Conrath* 1320.

In foliage this is very like *S. serrae*, Sond., but the very much longer and more erect branches of the corymb and much larger flower-heads at once distinguish it.

1483. **Senecio sulcicalyx,** *N. E. Brown* [Compositae-Senecionidae]; affinis *S. crassulaefolii*, Sch. Bip., sed caulibus multo brevioribus et gracilioribus, pedicellis longioribus, involucro conspicue sulcato et antheris purpureis bene distinguitur.

Herba succulenta humilis. *Caules* et *rami* 1–3 cm. longi, 3 mm. crassi, glabri, subnodosi, virides. *Folia* subconferta, adscendentia, 1·5–4 cm. longa, 6–8 mm. lata, 4–6 mm. crassa, carnosa, semitereti-lanceolata, supra depressa et sulcata, subtus valde convexa, apice acuta, basi in petiolum brevem attenuata, viridia, glanca. *Pedunculus* usque ad 7 cm. longus, 1·5 mm. crassus, apice furcatus vel uniramosis, viridis, leviter glaucescens. *Pedicelli* 2–3 cm. longi, glauci. *Capitula* discoidea, 20-flora 8–9 mm. diametro. *Involucrum* 6–7 mm. longum, 4–4·5 mm. diametro, cylindricum, breviter 12–13-dentatum, glaucum, profunde 12–13-atro-sulcatum. *Corolla* tubularis, 5-loba, alba. *Stamina* exserta, purpurea, polline lutea. *Styli* luteo-albi.

South Africa. Little Namaqualand: in crevices of quartz and granite rocks on the upper north-west slopes of a hill south-west of Chubiessis, *Pearson* 6198.

1484. **Dobera Alleni,** *N. E. Brown* [Salvadoraceae]; affinis *D. loranthifoliae*, Warb. sed foliis latioribus, petalis obtusioribus, tubo stamineo subduplo breviore apice inter filamentas dentato, antheris haud apiculatis et stylo duplo longiore differt.

Arbor magna, cortice ramorum cinereo. *Folia* opposita, glabra; petiolus 5–8 mm. longus; lamina 4·5–7·5 cm. longa, 2·2–4·5 cm. lata, lanceolata, ovata vel elliptica, obtusa vel subacuta, basi obtusa vel late rotundata, subtrinervia. *Paniculae* axillares, foliis breviores, 2–5 cm. longae, 2·5–6 cm. latae, ramis oppositis vel alternis minute tomentosis. *Flores* sessiles, oppositi vel subopposition. *Calyx* 2–2·3 mm. longus, subcampanulato-tubulosus, apice breviter et obtuse 4-dentatus, minutissime tomentosus. *Petala* 4, erecta, 3 mm. longa, 1·5 mm. lata, elliptica vel lanceolata, subacuta, glabra. *Glandulae* disci 4, magnae. *Tubus stamineus* 1·6 mm. longus, apice inter partes liberas 0·25 mm. longas filamentorum minute dentatus; antherae erectae, 1 mm. longae, deltoideo-ovatae, subobtusae nec apiculatae, basi cordatae. *Ovarium* cum stylo vix 2 mm. longum. *Fructus* immaturus, ovoideus, subacutus, calycem longe excedens.

Tropical Africa. Portuguese East Africa: Antari, *Allen* 95.

This curious genus although undoubtedly allied to *Salvadora*, yet in its free petals, stamens united into a tube and the four large glands exterior to the staminal tube, shows considerable affinity

to the genera *Aptandra* and *Ongokea* in *Olacineae*, but differs from them in its opposite leaves, tubular calyx, anthers and ovulation. Specifically it is certainly very similar to *D. loranthifolia*, Warb., but its flowers differ strikingly from those of that species by having a very much larger staminal tube, with teeth between the very short free part of the filaments, no apiculus to the anthers and a very much longer style.

1485. **Strophanthus hypoleucus,** *Stapf* [Apocynaceae-Echitideae]; affinis *S. Eminii*, Asch. & Pax, sed foliis rotundis minoribus subtus albo-pannoso-tomentosis, floribus solitariis longiuscule pedicellatis, florum caudis brevioribus, antheris magis minusve exsertis distinctus; a *S. Schuchardtii*, Pax, cui quoad habitum similis, florum structura plane differt.

Frutex ramis novellis tomentellis mox glabratis cortice castaneo vel fuscescente obtectis, lenticellis paucis orbicularibus majusculis. *Folia* rotundata, basi breviter contracta, apice saepius emarginata, 3–5 cm. diametro, supra viridia, tenuiter velutino-pubescentia, subtus albo-pannoso-tomentosa, nervis lateralibus utrinque circiter 6 obliquis, venarum reticulatione ob indumentum densum plerumque obscura; petioli tomentosi, ad 4 mm. longi. *Flores* in ramulis axillaribus vel terminalibus tenuibus folia plerumque valde reducta vel bracteolas gerentibus solitarii; ramuli ipsi solitarii, raro geminati, tomentelli; pedicelli 1 cm. longi. *Calyx* foliaceus, 0·8–1 cm. longus; sepala valde inaequalia, exteriora 3 ovata, ad 5 mm. lata, interiora lanceolata, omnia acuta vel subacuminata, utrinque tomentella (extus densius). *Corollae* tubus infundibuliformis, extus tenuiter tomentellus vel pubescens, parte infra staminum insertionem sita 7–8 mm. longa intus tenuissime parceque pubescente, parte superiore 6–7 mm. longa intus glabra; lobi oblongi, 1–1·3 cm. longi, 5 mm. lati, in caudam filiformem 3 cm. longam contracti; squamae fauciales ovatae, 1 mm. paulo longiores. *Antherae* 4–4·5 mm. longae, pro magna parte exsertae, acute acuminatae; filamenta superne dilatata, ad 3 mm. longa. *Ovarium* ima basi glabra excepta fulvo-hispidum. *Folliculi* ignoti.

Tropical Africa. Portuguese East Africa: Mount M'Kota near Ibo, *Stocks* 148.

1486. **Barleria Methuenii,** *Turrill* [Acanthaceae-Acanthoideae]; *B. Prionitis*, Linn. affinis, sed foliis angustioribus, sepalis brevioribus ciliatis recedit.

Frutex 3 m. altus (ex *Methuen*), ramis bisulcatis sulcis dense hirsutis exceptis fere glabris. *Folia* oblongo-linearia, apice obtuse mucronata, basi cuneata vel late cuneata, usque ad 3·5 cm. longa, 1·2 cm. lata, integra, costa supra leviter impressa infra prominente, nervis lateralibus pagina utraque inconspicuis; petiolus usque ad 5 mm. longus. *Inflorescentia* breviter spicata, floribus in foliorum superiorum minorum axillis solitariis; bracteolae elliptico-ovatae vel oblongo-lineares, longe acuminatae, usque ad 5 mm. longae (acumine incluso), 2 mm. latae, leviter ciliatae. *Spinae* (bracteolae steriles ?) usque ad 1·1 cm. longae, trifidae. *Calyx* fere ad basin divisus, segmentis 4 conspicue ciliatis, postico

ovato-oblongo apice obtuso vel rotundato mucronato 9 mm. longo 5 mm. lato, antico ovato-oblongo apice obtuse mucronato 8 mm. longo 5 mm. lato, lateralibus lanceolatis apice acute mucronatis 8 mm longis 2 mm. latis. *Corolla* bilabiata, 4·7 cm. longa, tubo 1·3 cm. longo, labio antico oblanceolato-oblongo integro apice rotundato 2 cm. longo 9 mm. lato, postico 3·4 cm. longo 2·7 cm. lato 4–oblato, lobis apice leviter emarginatis vel rotundatis, lateralibus obovatis 1·5 cm. longis 1·1 cm. latis, intermediis oblanceolato-oblongis 1·5 cm. longis 7 mm. latis. *Stamina* 2, filamentis 3 cm. longis glabris, antheris 4 mm. longis; pollinis granula globosa, 110 μ diametro; staminodia duo, 2 mm. longa. *Discus* 1·75 mm. altus; integer. *Ovarium* obpyriforme, 5 mm. altum, 2·25 mm. diametro, glabrum, biloculare, loculis uniovulatis; stylus 3·3 cm. longus, glaber.

MADAGASCAR. Ambotaba—Meloba (?), *P. A. Methuen* 30.

1487. **Cardanthera parviflora**, *Turrill* [Acanthaceae-Acanthoideae]; affinis *C. brevitubo*, Turrill (*Synnema brevitubo*, Burkill), sed foliis heterophyllis, corolla minore, stylis gracilioribus distinguitur.

Herba erecta, ramosissima, ramis hirsutis bisulcatis. *Folia* oblongo-vel lineari-oblanceolata, apice acuta, basi leviter angustata, usque ad 5·3 cm. longa et 9 mm. lata, integra plus minusve grosse serrata vel pectinata, hirsuta, costa pagïna utraque leviter prominente, nervis lateralibus inconspicuis. *Flores* 4–7 in foliorum superiorum axillis agregati. *Calyx* hirsutus, segmentis 5 linearibus acutis, postico 9 mm. longo 1 mm. lato, anticis et lateralibus 5 mm. longis 0·5 mm. latis. *Corollae* tubus 2 mm. longus, apice 3 mm. diametro, ima basi 1 mm. diametro, extra leviter pubescens, fauce pluri-squamatus; labium posticum valde reductum, apice integrum vel leviter bifidum, 2·5 mm. longum, 2·5 mm. latum, anticum 5 mm. longum, 4 mm. latum, trilobatum, lobis obovato-ellipticis 2 mm. longis 1·5 mm. latis basi lineis longitudinalibus carnosis aurantiacis ornatis. *Stamina* 4, filamentis 6 mm. longis glabris; antherae 1 mm. longae, loculis inter se aequalibus; pollinis granula globosa, 30 μ diametro, longitudinaliter costata. *Ovarium* cylindricum, 2·25 mm. altum, 0·75 mm. diametro, glabrum; stylus (cum stigmate) 5·5 mm. longus, hirsutus. *Capsula* biconvexe cylindrica, 4·5 mm. alta, 1·5 mm. diametro, valde bisulcata, glabra, retinaculis parvis haud curvatis; semina numerosa, biconvexe ovoideo-oblonga, dense et molliter pubescentia.

TROPICAL AFRICA. Northern Nigeria: Abinsi, a herb in rice fields, Dec. 1912, *J. M. Dalziel* 720.

Synnema has generally but incorrectly been considered an earlier name for *Cardanthera*. *Synnema* was described by Bentham as a genus of Scrophulariaceae in DC. Prodr. X., 1846, p. 538, while *Cardanthera*, a name given by Buchanan-Hamilton in MS., was first published by Voigt in "Hortus Suburbanus Calcuttensis." 1845, p. 482, being based on *Ruellia triflora*, Roxb. It is therefore clear that since *Synnema*, Benth. is not a nomen conservandum it must, according to the Vienna rules, be replaced by *Cardanthera*, Buch.-Ham. ex Voigt.

1488. **Sansevieria intermedia,** *N. E. Brown* [Liliaceae-Dracaeneae]; affinis *S. cylindricae*, Boj., sed foliis canaliculatis et aciebus canaliculi inferne acutis superne obtuse rotundatis differt.

Herba succulenta, acaulis. *Folia* erecta, rigida, ·45–1·20 m. longa, 1–1·8 cm. crassa, subcylindrica, facie canaliculata, dorso plurisulcata, apice acuta; canaliculus foliorum centralium inferne aciebus acutis superne obtuse rotundatis. *Racemus* cum pedunculo 20–45 cm. longus, densus, spiciformis. *Fasciculi* conferti, 3–6–flori. *Bracteae* 2–4 mm. longae, ovatae vel ovato-lanceolatae, acutae, membranaceae. *Pedicelli* 2 mm. longi, apice articulati. *Flores* leviter patuli; tubus 1·4–1·8 cm. longus, basi leviter inflatus et 2·5 mm. diametro, pallide virens; lobi 1·2–1·8 cm. longi, lineares, obtusi, revoluti, albidi, dorso minutissime purpureo-punctati.

Tropical Africa. British East Africa: Tsavo district, *Powell* 9.

Described from a living plant cultivated at Kew, which flowered Nov. 5th, 1913.

1489. **Juncus gentilis,** *N. E. Brown* [Juncaceae-Eujunceae]; similis *J. oxycarpo*, E. Mey., sed floribus sordide purpureo-castaneis segmentis minus attenuatis, stigmatibus subsessilibus, capsula perianthio breviore apice obtusiore et regione differt.

Herba perennis, erecta, ad 36 cm. (vel ultra ?) alta, omnino glabra. *Folia* radicalia 2–3, caulina 3, teretia, septata, 1 mm. diametro, basi vaginata; vaginae membranaceo-marginatae, apice in auriculas duas 3–5 mm. longas lineari-oblongas obtusas productae. *Cyma* terminalis, ramis 3 inaequalibus 4–9 cm. longis capituligeris. *Bracteae* membranaceae, floribus multo breviores, ovatae acutae. *Perianthii* segmenta 3 mm. longa, danceolata, acuminata, sordide purpureo-castanea, exteriora concava, carinata, interiora plana. *Stigmata* subsessiles. *Capsula* perianthio brevior, trigona, apice obtusa, minutissime apiculata. *Semina* sordide ochracea, apice nigra.

South Africa. Transvaal: near Modderfontein, *Conrath* 1173.

1490. **Cymbopogon plicatus,** *Stapf* [Gramineae-Andropogoneae]; *C. pruinoso*, Chiov., et *C. excavato*, Stapf, arcte affinis, sed laminis angustis plicatis costa subtus acuta, ligulis longioribus, paniculae axis primariae internodiis longioribus, ramorum fasciculis ideo magis dissitis et valva superiore profundius fissa distinctus.

Gramen perenne, dense caespitosum, rhizomate brevi, radicibus fibrosis permultis tenacibus ad 25 cm. longis albidis, innovationibus extra- et intravaginalibus illis vero axi e qua ortae sunt arcte adpressis; culmi fasciculati, erecti, graciles, saepe fere metrales, simplices, plerumque 4-nodi (infra inflorescentiam), internodiis ad 20–23 cm. longis. *Foliorum* vaginae glaberrimae, imae demum evanidae et culmi basin annuliformibus cicatricibus notatam gracilem ad 1·5 cm. longam radicantem desinentes, vel omnes diutiuscule persistentes et tunc a culmo retractae, rigidulae, arcte striatae, saepe laminam parvulam gerentes, superiores culmos arcte amplectentes, ad 7 vel interdum 10 cm. longae: ligulae scariosae, oblongae, 2–3 mm. longae secundum vaginae os

sensim decurrentes; laminae innovationum arcte plicatae vel superne explanatae, lineares, superne longe tenuiterque attenuatae, basin versus haud dilatatae, ad 3 mm. latae, foliorum caulinorum similes, nisi longiores (ad 15 vel interdum 18 cm. longae), ad 5 mm. latae et magis apertae, basi breviter contractae ut ligulae latera exponantur, omnes paulo glaucescentes, glabrae, praeter margines superiores asperulos laeves, marginibus saepe revolutis, costa supra albicante subtus acuta, nervis lateralibus paulo prominulis utrinque 4–5. *Paniculae* angustae, 10–18 cm. longae, rhachi primaria gracili 3–5-noda, nodis inferioribus 2·5–3·5 cm. distantibus; rami primarii e nodis inferioribus vel etiam mediis orti plerumque fasciculati, spatha laminigera lamina exclusa ad 4 cm. longa suffulti, superiores solitarii, e spatharum lamina destitutarum axillis orti, longiores 3–4 cm. longi, graciles, erecti, paucinodi, ramulis racemigeris e nodis inferioribus ortis fasciculatis vel omnibus solitariis; pedunculi racemorum paria gerentes, 4–7 mm. longi, spatha speciali lineari lanceolata acuta 1·5–2 cm. longa longe superati et ea toti vel fere toti inclusi. *Racemi* divergentes, plerumque deflexi; pedunculi speciales brevissimi, unus altero paulo longior, uterque in latere interiore pulvine epinastico villoso munitus; racemus subsessilis paulo brevior, plerumque 4-nodus, spicularum pare infimo homogamo ♂; pedunculatus plerumque 5-nodus, 1–1·5 cm. longus, spicularum paribus omnibus heterogamis; articuli pedicellique simillimi, graciles nisi infimi breviores paulo incrassati, 2 mm. longi, utrinque dense albo-ciliati, ciliis sursum accrescentibus articuli diametro usque ad duplum longioribus, apice in cupulam denticulatam uno latere magis productam dilatati. *Spiculae sessiles* ♀ anguste oblongae, 4–4·5 mm. longi, pallide virides vel saepius magis minusve purpurascentes, glabrae. *Gluma* inferior apice subacuta vel truncatula, in dorso fere tota longitudine latiuscule sulcata vel superne plana, 2-carinata, carinis superne anguste vel angustissime alatis scaberulis, nervis intercarinis 2 vel obsoletis, basi supra callum brevem impressa; gluma superior lanceolata, navicularis, acuta hyalina, 1-nervis, inferiori aequilonga. *Valva* inferior quam glumae paula brevior, anguste lanceolata, superne ciliata, tenuissime 2-nervis, vacua; valva superior ad medium bifida, linearis, 3 mm. longa, lobis angustissimis ciliatis, aristae columna laevi gracili 5–6 mm. longa, seta quam columna vix longiore. *Paleae* 0. *Antherae* 2–2·5 mm. longae. *Spiculae pedicellatae* (et sessilis paris homogami) ♂, lanceolatae, acutae, 4–4·5 mm. longae, virides vel purpurascentes. *Gluma* inferior 7–9-nervis (vel in spicula sessili ♂ 4-nervis), superior 3-nervis. *Valva* inferior oblonga, acuta, glumis subaequilonga, hyalina, tenuiter 2-nervis; superior 0. *Antherae* 2–2·5 mm. longae.

Madagascar. "Central Madagascar," *Parker* 12 (with the vernacular name " tena vèro "); Imerina, among tall grass on the hills, *Hildebrandt* 3256; without precise locality, Herb. Nogent-sur-Marne.

The root stocks and roots exhale a faint, sweet odour, like that of *Cyclamen europaeum*.

XVI.—MISCELLANEOUS NOTES.

Mr. F. G. Cousins.—We understand that Mr. F. G. Cousins, formerly a member of the gardening staff of the Royal Botanic Gardens, has been appointed a Sub-Inspector for the purposes of the Destructive Insects and Pests Acts under the Board of Agriculture and Fisheries.

Mr. J. F. Waby.—We learn that Mr. J. F. Waby, F.L.S., Head Gardener at the Botanic Gardens, Georgetown, British Guiana, has retired from this post after thirty-five years' service in the Colony. Mr. Waby's colonial experience commenced in Trinidad in 1873, where he was appointed Head Gardener to the Botanic Gardens on the recommendation of Kew. In 1879 he was transferred to British Guiana, and has held the post of Head Gardener at the Botanic Gardens, Georgetown, to their very great advantage since that date.

Mr. Waby was associated with the late Mr. G. S. Jenman in the work of building up the collections and generally developing the Gardens, which contain so fine a collection of interesting plants. During his long period of service in British Guiana he has acquired an intimate knowledge of the flora, as well as of economic plants, which has proved of great value to the Colony as well as to those who have been associated with him in the Agricultural Department.

We are glad to notice that Mr. Waby's retirement has been made the occasion for the presentation of a testimonial by Professor J. B. Harrison on behalf of the Board of Agriculture and the staff of the Department, and that the Governor, in appreciation of the valuable services rendered to the Colony by Mr. Waby, has been pleased to appoint him an honorary member of the Board of Agriculture.

The History of the Royal Botanic Gardens.—The acquisition for Kew, by exchange, of a bulky volume of manuscript and cuttings on the history of Kew, compiled by the late John Smith, senior Curator of the Gardens for many years, up to 1864, announced in *K.B.* 1913, p. 62, and the recent gift by Mr. John Reader Jackson, formerly Curator of the Museums, of a manuscript book by Alexander Smith, son of John, call for a few words of appreciation and explanation. It is so long since John Smith, senior, retired from active life that it is not superfluous to state that it was in consequence of failing sight, which soon developed into total blindness. Nothing daunted, he courageously continued publishing from the accumulations of a long period of activity. His intention had been to publish a history of the Gardens, but this was reduced to his "Records of the Royal Botanic Gardens, Kew," which appeared in 1880. The difficulties attending such a task, in the circumstances, are evident, and

how much original information still remains unpublished can only be ascertained by close comparison. But the manuscript certainly contains much of John Smith, senior's, opinions and experiences in relation to the changes that took place during his period of office that he wisely refrained from publishing. The manuscript by his son, Alexander Smith, presented by Mr. Jackson, is a "List of Stove and Greenhouse Plants in the Royal Botanic Gardens, Kew, prepared in 1848 (not complete)." To which J. Smith, senior, has added: "By Alexander Smith, my son, who died 15th May, 1865, aged 33." The list is throughout in Alexander's neat handwriting, with here and there a few additions and remarks by his father, who doubtless utilised it in his Records of upwards of fifteen years later; but there are many discrepancies not easy of elucidation. Alexander's list is, however, a highly interesting document of itself, whether compiled from the plants actually existing in the collection in 1848, or from registers covering a number of years. The classification adopted is that of Lindley's "Vegetable Kingdom," and the limitations of the natural orders are nearer that of Engler than that of Bentham and Hooker. I have not totalled the species, or names, myself, but in John Smith's handwriting at the end it is given as 5141—a grand number considering the relatively limited extent of the glasshouse accommodation then available. Accepting Lindley's limitations of the natural orders, 206 were represented in the indoor collections of those days. Succulents and hard-wooded plants were to the front. The list of *Cactaceae* runs to 260 species, belonging to eleven genera, and no fewer than 170 names of species of *Mesembryanthemum* are given. Taking the *Proteaceae* and *Ericaceae* among hard-wooded plants the former number 145 species belonging to twenty-three genera, and *Erica* itself is accredited with about 220 species, to say nothing of varieties, of which fifteen are given under *E. ventricosa* and seven under *E. vestita!* Cape *Amaryllidaceae*, *Iridaceae* and *Liliaceae* were also exceedingly numerous. On the other hand, of *Pelargonium* and *Geranium* combined, only 24 species are enumerated. Orchids are not enumerated in detail, but there is a reference to a "special list" of 815 species. These included, we are informed, a large number of inconspicuous kinds obtained from the famous Loddiges. Returning to the "History," it may be mentioned that there is an index to the "principal events" comprising about sixty headings, and there is a list of plants—"Additions to the Printed Records grown in different hot-houses before 1864." It comprises about 700 species. Looking at the long lists of names under *Mesembryanthemum*, *Erica*, etc., the presence of unpublished garden names might be suspected; but a careful collation of the 179 names of *Mesembryanthemum* with the "Index Kewensis" led to the discovery of no unauthenticated ones. Alexander Smith's list is evidently a compilation of great accuracy. Haworth figures almost exclusively as the describer of the new species of the period of *Mesembryanthemum*. Unfortunately the only guide to many of his species is limited to contemporary drawings in the Kew collection. As late as 1860. Kew still possessed a fine collection of these Mesembryanthemums.

consisting largely of veteran plants, which filled a small lean-to house at the back of a cottage or bothy on the site of the present T-range.

W. B. H.

Alexander Smith.—In connection with Alexander Smith referred to in the above note it may be mentioned that he arranged Sir W. Hooker's and his father's beginnings of a Museum of Economic Botany between the years 1847 and 1856. In the latter year he was appointed Curator of the Museum, but he resigned the post in 1857 owing to ill health. He was appointed clerk in the Herbarium in 1863, not curator as stated by Seeman (*see* Journ. Bot. 1865, pp. 199–200).

W. B. H.

Douglas Spar.—The following paragraph appeared in the *Kew Bulletin*, 1896, p. 97:—

"The great flagstaff in the Arboretum at Kew is one of the most conspicuous landmarks of the neighbourhood. It is the second of two spars which were presented to the Royal Gardens with great public spirit by Edward Stamp, Esq., of the firm of Messrs. Anderson, Anderson and Co. The first was from British Columbia, and was 118 ft. in length. It was broken in course of erection in 1859. The existing spar came from Vancouver Island, and is 159 ft. in length. It was erected in 1861, and is believed to be the tallest spar in the old world. The age of the tree from which it was cut was about 250 years, and its total height 180 ft. The base had gradually become decayed, and on examination it was pronounced by the Admiralty to be unsafe. Messrs. Anderson, Anderson and Co. were, however, of opinion that it might still be preserved, and on their recommendation the work was placed by H.M. Office of Works in the hands of Messrs. Robinson and Dodd, contractors to H.M. Indian Government, of Bridge Road Works, Poplar. They successfully lowered it, removed the decayed base, and spliced on a new one of pitch pine. The splice is held together by five iron bands. The spar was then re-erected on February 4th last."

It was estimated that by the above repairs thirty years had been added to the "life" of the spar. But this estimate has not been justified by experience.

It has been the rule to overhaul, scrape, varnish and do any minor repairs necessary to the spar and rigging at intervals of two years. When this was done in May last, it was discovered that "dry rot" had attacked the lower end of the new pitch-pine butt, and that "wet rot" had made considerable inroads in the splice of the old spar to the new butt. It was therefore decided to take it down so that a careful examination could be made of the whole spar, and any necessary repairs could be made.

The spar was successfully lowered in November last. From the closer examination which it was then possible to make, ample justification was found for taking it down. The "dry rot" affecting the butt had evidently commenced in the sleeper plate on which the spar stood, and spread up the new butt to a height

of about 7 ft. At the bottom end, for a height of about 2 ft., more than half the sectional area had been completely destroyed. Yet nothing of this was apparent at the surface, which was well covered with a film of tar.

The original spar which was spliced into the new butt was found to have suffered severely from "wet rot." This extended from the bottom of the splice to a height of some 30 ft. up the spar. The outer varnished surface appeared generally sound. But the rains which had beaten against the spar had entered the ever-active shakes, and travelled down shakes and tissue to the splice which was quite sodden. There was no way of escape for this enclosed water, and so wet rot resulted. There remains about 110 ft. of the original spar in a fairly sound condition, and this may be considered worthy of re-erection.

It is to be hoped, however, that in course of time a new spar may be forthcoming from Vancouver, which, like its predecessor, would serve as an object lesson and give some idea of the grandeur of the great Douglas Fir trees of the Island.

Presentation of Conifer Cones by Sir Harry J. Veitch.—Sir Harry J. Veitch has generously presented to the Royal Botanic Gardens, Kew, the important collection of Conifer cones which for many years has formed so interesting a feature of the Veitchian establishment at Chelsea. It consists of 170 species, including upwards of 60 Pines, 26 Firs, and a similar number of Spruces. The collection is of historical as well as of botanical interest for, in the main, it comprises the specimens contributed by Messrs. Veitch's collectors in North and South America, China, Japan and other countries between 1840 and the present date. Between 1849 and 1852 Mr. W. Lobb collected large quantities of seeds of various Western North American Conifers which had been previously noted by Douglas, and it was owing largely to his energy that such species as *Pinus Sabiniana*, *P. Coulteri*, *P. muricata*, *P. tuberculata*, *P. monticola*, *P. Lambertiana*, the two Sequoias, *Abies magnifica*, *A. nobilis*, and *A. Lowiana* became widely distributed. During the latter half of the nineteenth century the collection was added to by many collectors, including Mr. John Gould Veitch, who, amongst other countries, visited Japan and Australia between the years 1860 and 1870. In recent years a number of Chinese species have been added by Messrs. E. H. Wilson and W. Purdom, a few of the newer species being *Abies recurvata*, *Picea asperata*, *P. complanata*, *P. purpurea*, *P. montigena* and *P. Wilsoni*. Cones of European species and of various kinds ripened in this country were added from time to time by the late Mr. A. H. Kent, and it was from the cones in this collection that Mr. Kent drew up his descriptions for "Veitch's Manual of Coniferae," a book which has long been looked upon as a standard work on the subject. The first edition appeared in 1881 and the second in 1900.

A few of the most striking looking cones in the collection are *Pinus Coulteri*, weighing 3 lbs. 14½ ozs., *P. Ayacahuite*, 15 inches long, *P. Lambertiana*, 18 inches long and *Araucaria Bidwillii*, 3 lbs. 4 ozs. in weight.

W. D.

Presentation of Old Keys.—Two relics of a long past régime at Kew have recently been presented to the establishment by the Hon. Arthur F. G. Leveson-Gower. They are two keys of an old pattern, one of them inscribed "Botanic Garden V.R."; the other "Kitchen Garden No. 2, W.R." There is no doubt they were used during the period between the accession of William IV. in 1830, and the transference of the Botanic Garden at Kew to the public by Queen Victoria in 1840. At this time the northern part of Kew nearest Kew Green was divided up by walls, some of which had originally enclosed the gardens attached to the houses on the south side of the Green. The Botanic Garden itself, covering 9 acres was wholly or partially enclosed by walls, a remnant of which (the only one that now remains above ground) is close to the old ice well and hardy fernery. The key inscribed "Botanic Gardens, V.R." was, no doubt, used for entrances through these walls, or for the plant-houses inside.

One of the first alterations effected by Sir W. Hooker after his appointment in 1841, was the gradual removal of these walls, which must, of course, have debarred the production of broad effects by lawns and trees, such as now exist. On the other hand, many interesting wall plants—some of historical interest—must have disappeared, as well as many snug corners such as the cultivator of tender exotics would delight in.

With regard to the "Kitchen Garden" inscribed on the other key, this occupied the ground in the north-east corner of the grounds now given over to the cultivation of herbaceous plants. It is bounded on the east by the Kew Road wall and on the west by another brick wall. William Townsend Aiton, when he resigned the administration of the Botanic Garden in 1840 still retained charge of this Kitchen Garden and the Pleasure Grounds. In 1846, after 53 years' service in the establishment, he resigned the management of these also.

The history of these keys—could one learn it—might be interesting. They were purchased by Mr. Leveson-Gower in an old shop and can scarcely have been of use to anyone for some sixty or seventy years past. The residents in some of the houses on the south side of Kew Green backing on to the Gardens were officials or retired servants of the Crown, who had the privilege of entry into the Gardens. Perhaps to one of these the keys may have been issued and by them not returned when the walls or entrances were removed. At the present time a register of the official keys is kept and a periodical inspection rigidly maintained.

W. J. B.

Orchids Flowered at Kew in 1913.—The collection of Orchids cultivated under glass is well known for its richness in types and for the large number of rare and little-known species it contains.

The year 1913 has been remarkable on account of the large number of species belonging to 137 distinct genera which have flowered in the collection. A careful record has been kept of each plant which has flowered during the year and from this we find that the only plant of *Cirrhopetalum Mastersianum* has flowered

on six occasions, *Dendrocolla Pricei*, a new species, and *Kefersteinia graminea* on three and quite a number of other plants have flowered twice during the year. A few fine specimen plants have also flowered profusely, the best of these being:—*Eria hyacinthoides* with 34 racemes, *Eulophiella Elisabethae* with 11 racemes, *Vanda suavis* with 14 racemes, *Calanthe* × *Dominyi* with 15 racemes, *Coelia macrostachya* with 6 racemes, *Pleurothallis Roezlii* with 31 racemes, and *Miltonia candida* with 32 racemes bearing 274 flowers. *Lycaste Deppei* bore 54 flowers; *L. gigantea* 16 flowers; *Cirrhopetalum robustum* 7 umbels of flowers, and *Cattleya* × *Portia* had an inflorescence of 13 flowers.

The following list includes all those genera which have flowered during the year, only those species being mentioned which have been exceptionally fine or which are of particular interest on account of their rarity:—

Acampe, 3 species, including *A. papillosa*.
Acanthophippium sylhetense.
Aceras hircina.
Acineta Humboldtii.
Ada aurantiaca and its var. *maculata*.
Aerides multiflorum, *A. Vandarum*, *A. virens* and several other species.
Amblostoma cernuum.
Ancistrochilus Thomsonianus.
Angraecum citratum, *A. Dubuyssonii*, *A. Eichlerianum*, *A. falcatum*, *A. Kotschyanum*, *A. Scottianum* and several other commoner species.
Anguloa, 4 species, including *A. uniflora* and *A. virginalis*.
Ansellia, 4 species, including *A. humilis*.
Appendicula anceps.
Arpophyllum spicatum.
Arundina bambusaefolia.
Aspasia lunata.
Bartholina pectinata.
Bifrenaria Harrisoniae, *B. vitellina*.
Bletia catenulata and 2 other species.
Bletilla formosana.
Bonatea speciosa.
Brassavola, 7 species, including *B. cucullata*, *B. glauea*, and *B. Digbyana*.
Brassia, 5 species, including *B. brachiata*, *B. Lawrenceana*, and *B. caudata*.
Brassocattleya Lindleyana (a natural hybrid).
Broughtonia sanguinea.
Bulbophyllum, many species, including *B. auricomum*, *B. barbigerum*, *B. cocoinum*, *B. Dayanum*, *B. flavidum*, *B. Gentilii*, *B. galbinum*, *B. lilacinum*, *B. rufinum*, *B. saltatorium*, *B. uniflorum*, and *B. virescens*.
Calanthe, several species, among them *C. rubens* and a fine lot of hybrids, including a large specimen of *C. Dominyi*, the latter being the first artificially raised hybrid Orchid.
Camaridium purpuratum.
Catasetum, 20 species, including *C. Claesianum*, *C. Dar-*

winianum, with ♀ and ♂ flowers on the same inflorescence, *C. fimbriatum*, *C. planiceps*, *C. globuliflorum*, *C. Hookeri*, *C. spinosum*, and *C. Lemosii*.

Cattleya, many species and hybrids, including a few rare species such as *C. Walkeriana* and *C. Rex*, also the natural hybrid *C. sororia*.

Chondrorhyncha, 4 species, including *C. bicolor*, a plant new to cultivation.

Chysis, 3 species.

Cirrhaea viridipurpurea.

Cirrhopetalum, many species, including the new *C. campanulatum*, also many rarities, such as *C. Mastersianum*, *C. robustum*, *C. biflorum*, *C. longissimum*, *C. picturatum*, *C. Fascinator*, &c., &c.

Cleisostoma secundum.

Cochlioda, 4 species.

Coelia, 3 species, including a very fine specimen of the handsome *C. macrostachya*.

Coelogyne, 38 species, including *C. Huettneriana*, *C. graminifolia*, *C. sulphurea*, *C. perakensis*, *C. Rossiana*, *C. Lawrenceana*, *C. sparsa*, *C. Swaniana*, *C. testacea*, *C. Veitchii*, and *C. Mooreana*.

Colax jugosus.

Coryanthes macrantha.

Cryptophoranthus Dayanus.

Cycnoches, 6 species bearing male flowers, including *C. stelliferum*, also two species, *C. maculatum* and *C. ventricosum*, with the rarely produced female flowers.

Cymbidium, 14 species, including *C. grandiflorum*, *C. Schroederi*, *C. Gammieanum*, *C. sinense*, and *C. pendulum*, also a number of fine hybrids.

Cynorchis compacta, *C. Lowiana*, *C. Morlandii*, and *C. kewensis*.

Cypripedium, 33 species and a large number of hybrids.

Cyrtopodium punctatum.

Dendrobium, 47 species, including *D. Bronckartii*, *D. Foxii*, *D. Sanderae*, *D. Dearei*, *D. Dartoisianum*, *D. falcorostrum*, *D. longicornu*, *D. revolutum*, *D. sanguinolentum*, var. *album*, *D. Schuetzei*, *D. secundum*, *D. superbiens*, and *D. Victoria-Reginae*, also many fine hybrids.

Dendrocolla Pricei, a new species from Formosa.

Diacrium bicornutum.

Disa grandiflora.

Epidendrum, 31 species, including *E. Allemanii*, *E. ciliare*, *E. Cooperianum*, *E. equitans*, *E. Hartii*, *E.* (*Nanodes*) *Matthewsii*, *E.* (*Nanodes*) *Medusae*, *E. purum*, *E. Wallisii*, and a new species from Costa Rica, viz. *E.* (*Nanodes*) *Lankesteri*.

Eria, 20 species, including *E. longispica*, *E. major*, *E. hyacinthoides*, *E. Corneri*, *E. convallarioides*, *E. rhodoptera*, and the type plant of *E. rhynchostyloides*.

Eulophia, 6 species, including *E. guineensis*, *E. Ledienii*, and the type plant of *E. paniculata*.

Eulophiella Elisabethae, a large healthy specimen of this rare Orchid bore 11 racemes.

Gomesa planifolia and *G. crispa*.

Gongora, 4 species, including *G. grossa*.
Govenia tingens and *G. lagenophora*.
Grobya galeata.
Haemaria discolor.
Hemipilia calophylla.
Hexadesmia crurigera and *H. fusiformis*.
Ione bicolor and *I. grandiflora*.
Ionopsis paniculata.
Isabelia virginalis.
Kefersteinia laminata and *K. graminea*.
Laelia, many species, including *L. crispilabia*, *L. Lundii*, *L. Gouldiana*, and *L. superbiens*.
Lanium Berkeleyi.
Leptotes bicolor.
Liparis, several species, including *L. Bowkeri*, *L. longipes*, and *L. quineensis*.
Lissochilus Krebsii.
Listrostachys, 12 species, including *L. Chailluana*, *L. bracteosa*, *L. caudata*, *L. forcipata*, *L. hamata*, and *L. Monteirae*.
Lockhartia robusta, *L. elegans*, and *L. lunifera*.
Luisia, 5 species, including *L. brachystachys*, and *L. Psyche*.
Lycaste, 16 species, including the new *L. peruviana*, also *L. gigantea*, *L. Dyeriana*, *L. lanipes*, and *L. xytriophora*.
Masdevallia, 52 species, including *M. deorsa*, *M. gemmata*, *M. Ephippium*, *M. Houtteana*, *M. Laucheana*, *M. Moorcana*, *M. O'Brieniana*, *M. Peristeria*, *M. polysticta*, *M. Reichenbachiana*, and *M. Wendlandii*.
Maxillaria, many species, including *M. arachnites*, *M. grandiflora*, *M. elatior*, *M. madida*, *M. venusta*, *M. Sanderiana*, and *M. tenuifolia*.
Megaclinium, 7 species, including *M. Bufo* and *M. eburneum*.
Meiracyllium gemmae.
Microstylis commelynaefolia.
Miltonia, 12 species, including a fine specimen of *M. candida*.
Mormodes revolutum and *M. aromaticum*.
Mormolyce lineolata.
Mystacidium, 6 species, including *M. Germinyanum*, *M. pectinatum*, and the type plant of *M. angustum*.
Neobenthamia gracilis.
Oberonia ensiformis and *O. pachyrachis*.
Octomeria diaphana and 5 other species.
Odontoglossum, 41 species, and many fine hybrids.
Oncidium, 52 species, including *O. abortivum*, *O. Cebolleta*, *O. exasperatum*, *O. graminifolium*, *O. longipes*, *O. suave*, *O. maizaefolium*, *O. praestans*, *O. pumilum*, *O. trulliferum*, *O. uniflorum*, and *O. Waluewa*.
Ornithidium densum, *O. Sophronitis*, and *O. coccineum*.
Ornithocephalus grandiflorus.
Otochilus porrectus.
Pelexia maculata.
Phaius, 3 species and a number of fine hybrids.
Phalaenopsis, 9 species, including *P. Sanderiana*, *P. pallens*, *P. Lueddemanniana*, and *P. tetraspis*.

Pholidota, 7 species, including *P. conchoidea*, *P. Lugardii*, *P. chinensis*, and *P. Convallariae*.

Phragmopedilum, 6 species, including *P. Sargentianum* and *P. caricinum*, also a number of hybrids.

Physosiphon Loddigesii and *P. Lindleyi*.

Platanthera iantha.

Platyclinis, 7 species, including *P. arachnites*, *P. Cobbiana*, *P. latifolia*, and *P. filiformis*.

Pleione, 4 species, including *P. yunnanensis*.

Pleurothallis, 16 species, including the new *P. Birchenallii*.

Plocoglottis porphyrophylla.

Polystachya, 8 species, including *P. affinis*, *P. luteola*, *P. tessellata*, and *P. caespitosa*.

Prescottia plantaginifolia.

Promenaea stapelioides and P. xanthina.

Renanthera coccinea and *R. Imschootiana*.

Rodriguezia venusta and 4 other species.

Restrepia, 8 species, including *R. guttulata*, *R. pandurata*, and *R. antennifera*.

Rhynchostylis retusa.

Saccolabium, 8 species, including the rare *S. bellinum* and *S. penangianum*.

Sarcanthus, 5 species, including *S. insectifer*, *S. pallidus*, and *S. secundus*.

Sarcochilus Fitzgeraldii and *S. Hartmanni*.

Satyrium odorum and *S. ligulatum*.

Scaphosepalum, 4 species, including *S. ochthodes*.

Scaphyglottis prolifera.

Schomburgkia rosea, *S. Thomsoniana*, and *S. Wallisii*.

Scuticaria Hadwenii and *S. Steelii*.

Sievkingia peruviana, a very rare Orchid.

Sobralia, 6 species, including the new *S. valida*, also a number of garden hybrids.

Sophronitis cernua, *S. grandiflora*, and *S. violacea*.

Spathoglottis plicata and 2 hybrids.

Spiranthes picta.

Stanhopea, 12 species, including *S. guttulata*, *S. platyceras*, *S. ecornuta*, *S. elegantula* and *S. oculata*.

Stelis, 4 species, including the new *S. barbata* from Costa Rica.

Stenoglottis longifolia.

Stigmatostalix radicans.

Trichopilia, 7 species, including *T. Backhouseana* and *T. laxa*.

Theodorea gomezoides.

Thrixspermum unguiculatum.

Thunia, 6 species and 2 hybrids.

Trias picta.

Trichosma suavis.

Vanda, 14 species, including *V. coerulescens*, *V. Dearei*, and *V. Watsonii*.

Warrea Hookeriana.

Warscewiczella Wendlandii.

Xylobium, 4 species, including the new *X. ecuadorense*.

Zygopetalum, 4 species.

Zygosepalum rostratum.

C. P. R.

Euphorbia Tirucalli.—When working up the Tropical African species of *Euphorbia* I came to the conclusion that the plant described and figured in Reede, Hortus Malabaricus, vol. 2, p. 85, t. 44, under the name of *Tiru Calli*, and upon which *Euphorbia Tirucalli*, Linn. was founded, could not be the same as any African species I had seen, so different did it appear by its mode of flowering in the forks of the branches and in its pedicellate flowers. At that time the flowers of the true *E. Tirucalli* of India were quite unknown to me, none being present upon any herbarium specimens I had seen. Subsequently, however, flowers of the true *E. Tirucalli* have been sent from India by Mr. Cecil E. C. Fischer, Deputy Conservator of Forests, Madras, which amply demonstrate that I was wrong in my conclusion that the plant which I have described under the name of *Euphorbia media* in the Flora of Tropical Africa, vol. 6, pt. 1, p. 556, was distinct from *E. Tirucalli*, Linn., as I now find upon comparison with the Indian specimens that *E. media* is unquestionably the same as *E. Tirucalli* and must rank as a synonym of that species.

Probably *E. Tirucalli* was introduced into India by the Portuguese from some part of East Africa, where it extends from German East Africa southwards as far as the Transkei in South Africa, growing as a big bush or tree up to 20 ft. high.

In Natal there is an extensive forest of *E. Tirucalli*, and about 1910, Dr. Aurel Schultz, of Durban, stated that rubber of good quality could be extracted from it by a process he had invented. In consequence of his researches and report a company has been formed and a rubber industry said to be of considerable importance is now established in Natal. The latex extracted from the trees is imported in the raw state to England, where the rubber is freed from the resinous and other matters mixed with it and then mixed with rubber of a better quality and used for making tyres for bicycles and motor cars.

The milky sap of *E. Tirucalli* produces a very disagreeable burning sensation when applied to the skin and affects some people more than others. Dr. J. Medley Wood, the Director of the Natal Herbarium at Durban, writes of it as follows:—"The sap of this plant is most virulent, as I found to my cost when living at Inanda. I simply broke off a small portion of the end of a branch when showing it to a lady, and suffered excruciating pain for nearly the whole of the night. All I could do was to bathe the part affected with cold water, as we had no doctor within more than 20 miles."

N. E. B.

Botanical Magazine for February.—The plants figured are *Ampelopsis megalophylla*, Diels & Gilg (t. 8537); *Actinidia chinensis*, Planch. (t. 8538); *Smilacina paniculata*, Mart. & Gal. (t. 8539); *Rondeletia cordata*, Benth. (t. 8540) and *Viola gracilis*, Sibth. & Sm. (t. 8541).

Ampelopsis megalophylla is a remarkably vigorous Vine, producing growths eight to ten feet long in a single summer, and has extraordinarily large leaves, sometimes nearly three feet long.

The leaves vary from pinnate to subtripinnate, and are green above and glaucous beneath. Its large cymes of fruit, at first red-purple, finally blackish, add to the value of the plant as an ornamental climber. The species is a native of Central China, and first appeared in cultivation in Europe in Mr. M. L. de Vilmorin's garden at Les Barres, where seeds were received in 1894. In 1901 the plant was introduced a second time by Messrs. J. Veitch & Sons, through their collector, Mr. E. H. Wilson. The specimen figured was sent to Kew by the Right Hon. L. Harcourt, M.P., from his garden at Nuneham.

The *Actinidia* is one of Messrs. Veitch's introductions from China, and the plant from which the material for the illustration was obtained was received from them in 1905. It grows freely in the Himalayan House, the plant there having stems some twenty feet long. Its orange-yellow flowers are $1\frac{3}{4}$–2 inches across, borne in cymes springing from the axils of fallen leaves, and in the Kew plant are all functionally male. The fruits are edible, and have a flavour resembling that of the gooseberry.

Smilacina paniculata, a native of Guatemala and Southern Mexico, has been introduced by Messrs. F. Sander & Sons, of St. Albans, who sent to Kew the material for the figure, obtained from a plant which flowered in March, 1913. It is a glabrous herb with ovate-lanceolate long-acuminate leaves, 5–6 inches long, and terminal panicles about $2\frac{1}{4}$ inches long, striking in being entirely snowy-white. The plant is likely to be of some value in the greenhouse.

Rondeletia cordata is well-known in cultivation, having been introduced from Guatemala in 1844. It is often found in collections under the name of *Rogiera cordata*. Pentamerous and hexamerous flowers occur in the same inflorescence, and it has been observed that dimorphism exists in the relative length of the style and the position of the stamens. Of this useful and handsome plant there is a good specimen in the greenhouse at Kew.

Viola gracilis has deservedly become very popular during the last few years, and is now represented in gardens by various forms, differing in the size and colour of the flowers. The species was originally discovered on Mount Olympus in Bithynia. It has since been recorded from Macedonia and probably occurs also in Montenegro. The plate was prepared from a plant obtained for the Kew collection by purchase in 1907.

The Gardens Bulletin, Straits Settlements.—We welcome the continuation of the Agricultural Bulletin of the Straits and Federated Malay States which has appeared as Vol. I. No. 6 of the third series of that Journal, under the editorship of Mr. I. H. Burkill. Five numbers of the Bulletin were published between January and May, 1912, and the publication has now been resumed by the issue of No. 6 under an altered title on December 15th, 1913. The *Gardens Bulletin* is to be an occasional publication, as it was when originally started in 1891, since the Federated Malay States have now an agricultural journal of their own.

The number under notice contains several original articles of interest, and we observe with pleasure that original articles are to be a feature of the new series, and that market reports and proceedings of meetings will not be included.

Attention may be drawn to a long and useful article on cocoa-nut beetles, and to the account of the explosive flowers of the orchid *Plocoglottis porphyrophylla* among the "Notes on plants of interest in the Singapore Gardens."

Botanical Progress in British Columbia.—The following information has been extracted from an interesting letter received from Mr. J. Davidson, the Provincial Botanist of British Columbia:—

The botanical work in British Columbia is making great progress, and all through the Province people are interested in the work and are ready to respond to requests for information. A complete botanical survey is contemplated and material and data are being collected for this purpose. A herbarium is being formed and already several thousands of specimens have been obtained, while in less than three years several plants new to British Columbia and probably some new species have been collected. Correspondents in different parts of the Province supply specimens and information regarding the plants in their immediate neighbourhood, while where there are no correspondents the flora is ascertained by exploration trips. The Surveyor-General allows his men, who are exploring new regions of British Columbia, to collect material and data for the botanical survey.

Last year the formation of a botanic garden and arboretum was commenced, and it is hoped that over 1500 native seed plants will be cultivated in the area of ground set aside by the Government. Already 500 species are established and as very many of these are showy and suitable for garden purposes it is hoped that the collection will increase the interest of the general public in the wealth and beauty of their native plants. It is expected that another botanic garden will be started this summer in connection with Stanley Park on the Pacific coast.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3] [1914

XVII.—HINTS FOR COLLECTORS.

The following notes on the collecting of botanical specimens are issued for the convenience of collectors and travellers who may desire to send home plants in the living or dried condition, or who may be interested in collecting plants or plant products from the economic point of view.

In collecting unknown plants in the living condition in the form of seeds, tubers, &c., it is desirable that, when possible, herbarium specimens should also be collected by which the plant may be identified. In all such cases the collecting number borne by the dried specimen should also be given to the packet of seeds or the plant sent. Similarly, with native names, it is of great practical value that these should be accurately recorded, both for living and dried specimens, and where both living and dried specimens are sent the vernacular name should be given with each specimen.

I.—HORTICULTURAL DEPARTMENT.

1. **Seeds.**—When procurable, seeds should be preferred to living plants or cuttings. In a few instances, for example orchids and tuberous-rooted plants such as the tuberous aroids and many of the ginger family, *Zingiberaceae*, seeds are either of little value or too slow in giving a result; in such cases tubers or plants are preferred. On the other hand, Palms, Pandanads, Bamboos and many economic plants can be best introduced and established by means of seeds. The seeds should be ripe, and should be carefully dried before being packed. If it is not convenient to despatch the seeds at once, they should be kept dry and at a regular temperature. The facilities afforded by the post, however, make the despatch of small packages easy. Canvas bags should be used in preference to paper packets. Collectors now find it convenient to provide themselves with a stock of these in various sizes. If possible, wood tallies, with the names or numbers of the seeds, should be enclosed in the bags, as paper labels are liable to rot because of moisture from the seeds. The paper packet and wooden box were employed by Mr. E. H. Wilson when collecting seeds in China for Messrs. J. Veitch &

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Sons, and his success was remarkable. Hermetically sealed tin boxes and glass bottles should not be used, the seeds keeping fresh longest when they are so packed as to be able to part with moisture in reason. Experience has shown that all kinds of seeds, even of the commonest vegetables, may be sent successfully to the most distant tropical countries by enclosing them in ordinary paper or canvas bags, and these in a wood packing-case. It is advisable to sow the seeds as soon as possible after their arrival, although where the conditions are favourable they may be kept a month or more before sowing. Small packets may be sent by sample post: packages sent by post are almost always a success. Large quantities should be packed in a water-tight box and labelled "Seeds, perishable, to be kept cool and dry." Oily seeds, such as those of the rubber-yielding plants *Landolphia*, *Manihot*, *Hevea*, most of the *Magnoliaceae* and many of the Palms and *Leguminosae*, and those which soon lose their vitality when kept dry, such as acorns, should be packed in moist, but not wet soil, or a mixture of soil and charcoal, in wooden boxes. Such seeds may often be successfully transported in the soil of Wardian cases.

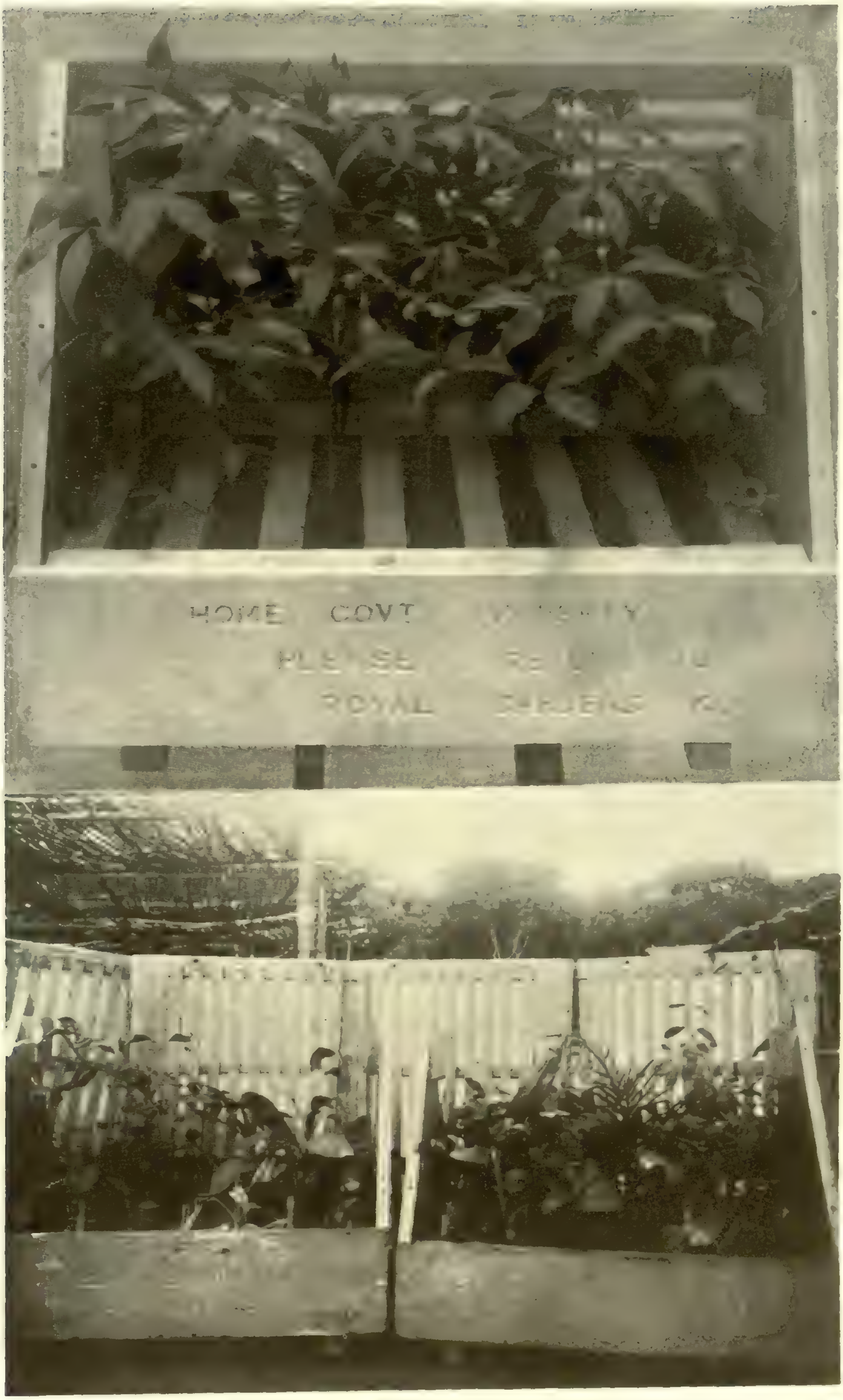
2. **Bulbs, Rhizomes and Tubers.**—These should be gathered at the end of the growing season and kept dry for a few days until the foliage has withered. They may then be packed in a wooden box in wood shavings, paper, or any dry and light material. Straw and hay, however, are apt to become mouldy and should not be used for this purpose. The rhizomes, bulbs or tubers should be packed in the box in such a manner that they cannot move about, as they are very liable to perish if bruised during transit. When the rhizomes are small or thin, they travel best if packed in slightly moistened light material, such as cocoa-nut fibre, peat soil, sawdust, or wood shavings.

Rhizomes or seeds of aquatic plants, filmy ferns, and ferns generally, other than tree ferns, travel best if packed in boxes in moist moss. In sending large ferns the fronds should be removed before despatch.

Cuttings.—Cuttings of some plants (such as *Pelargonium*) may be successfully sent for fairly long distances if tightly wrapped in oiled silk, without external moisture, and packed in tin cylinders or wood boxes.

Ripened growth of many succulent plants, such as Cacti, Euphorbias, Senecios, Stapelias, &c., may be safely collected and sent home in this way. The cuttings should be taken off where there is a constriction or articulation of the stem, and laid out in the sun for a short time to free them from extraneous moisture; they should then be tightly packed in a stout box in dry paper, or some other elastic substance, to keep them from bruising one another. Wood shavings, if thoroughly dried, are an excellent material for this purpose.

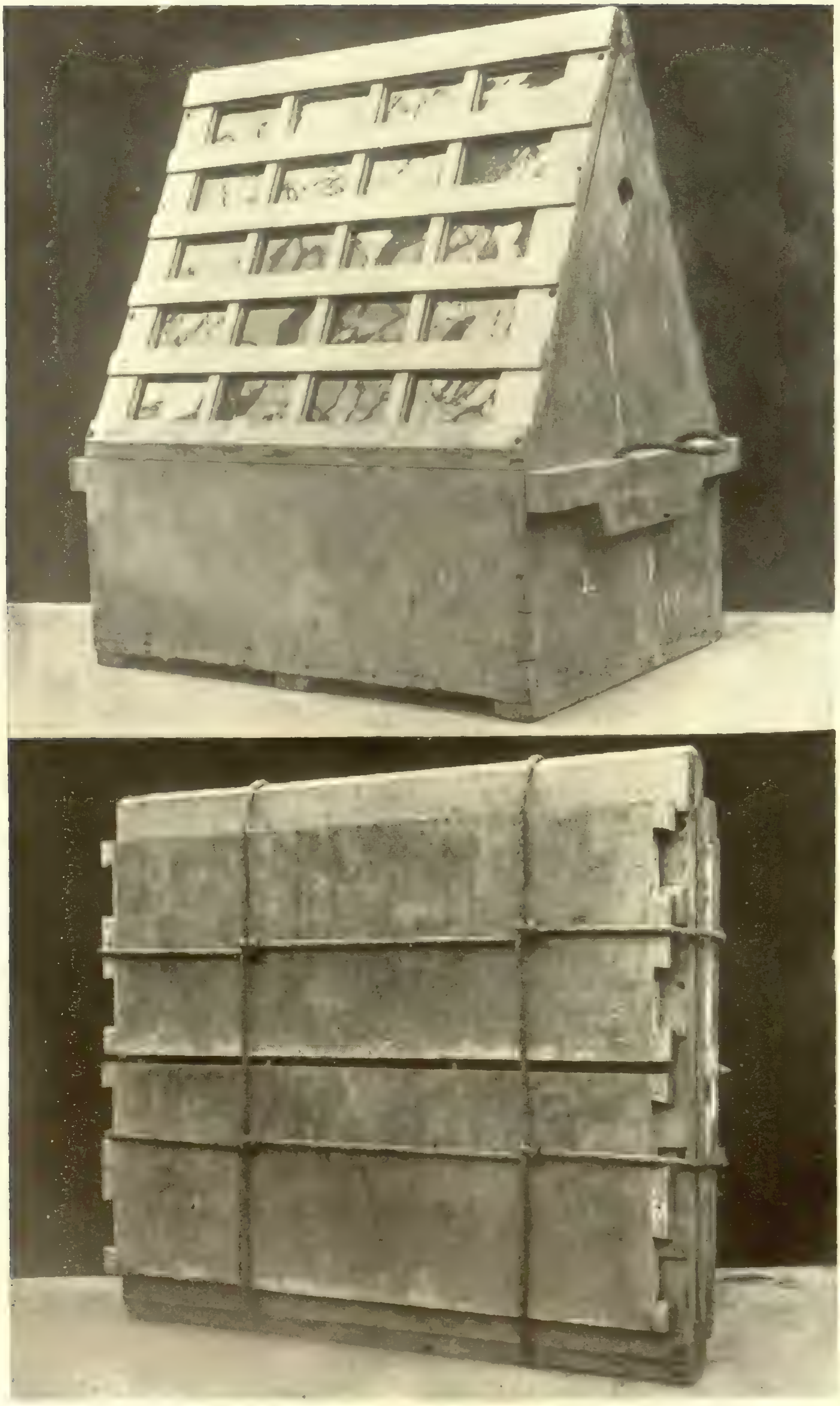
3. **Tree Ferns, Cycads, and Succulent Plants.**—Tree ferns should be dug up in the resting season with a small ball of earth sufficient to keep a few roots alive; the fronds may be cut away or



1. Wardian case ready for despatch.

2. Two cases on arrival in Uganda.

To face page 98.



SMALL PORTABLE WARDIAN CASE.

To face page 99.

bent down and tied to the stems. They should then be packed in boxes in sawdust or cocoanut fibre. Cycads may be treated in the same way, except that they may be sent in boxes without packing of any kind. Succulent plants, such as Agaves, Aloes, and Cacti will travel safely if packed in a ventilated box in dry shavings, and directed to be stowed in a cool, dry place on board ship.

4. **Orchids.**—Those kinds which have fleshy pseudobulbs, such as *Dendrobium*, *Epidendrum*, *Cattleya*, *Catasetum* and *Odontoglossum*, should be collected at the end of the growing season, dried a little by exposure, and then packed in light boxes in dry wood shavings. Wide, shallow boxes are preferable to deep boxes; the latter, if used at all, should have battens placed across to support the upper layer of plants and prevent the others being crushed. A few holes should be bored into the sides of the boxes for ventilation. They may be sent by steamer and labelled "For cool, dry place in hold." *Phalaenopsis*, *Vanda*, *Cypripedium*, and all such Orchids which have no fleshy stem or pseudobulb, should be packed in close boxes or Wardian cases with damp moss or soil. If possible, they should have attention during the voyage. Tuberous Orchids may be sent as advised for tubers.

5. **Wardian Cases.**—This method is an expensive one, and should therefore only be used for plants which cannot be sent by any other means. Where convenient, the plants should be established in pots before being packed in the cases; if this cannot be done, the plants should be placed in soil in the cases several weeks, if possible, before despatch. Plants dug out of the ground and immediately sent on a long voyage have a poor chance of surviving. In packing, the soil should be rammed firmly about the pots or roots of the plants, and they should be kept in position by fastening strips of batten transversely between the rows. This is important as a guard against accident in case of overturning or rocking. The plants should be moderately moist at the roots when packed, but no water should be given immediately before the cases are screwed up. Many plants are killed by the excessive moisture inside the case which results from saturating the soil at the time of packing. Slender and weak plants should be supported by upright stakes. Each plant should have a label bearing its name or number, and this should be securely fastened to the stem or stake of the plant itself. The glass of the case should be protected by stout laths or strong wire netting. When first invented the success of the Wardian case as a means of carrying plants long distances was supposed to depend on its being kept absolutely air-tight. It is found, however, that the plants travel better when a small hole about $1\frac{1}{2}$ inches in diameter is bored in each end of the case near the top. Wardian cases should always be conspicuously labelled, "For Deck; under Awning."

The illustration shows the condition on arrival of the contents of two Wardian cases recently sent from Kew to Uganda. The cases were despatched from Kew on June 11th and reached Kampala, Uganda, on July 22nd, when the photograph was

taken. Thirty-seven plants had been packed in each case, and of these only six were dead in one case and seven in the other.

The plate facing p. 99 depicts a small portable Wardian case, constructed for use in the tropics, after its return from New Guinea packed with plants. The case is made of $\frac{3}{4}$ in. hard deal, well painted, and measures inside 23 in. long by 17 in. wide, and is 26 in. high. It is so constructed that it can be taken to pieces and packed in an easily portable parcel, and can readily be put together by means of a few screws. The weight of the case when empty is 22 lbs.

To admit light talc in small sheets has been used instead of glass, both for the sake of lightness and to obviate the danger of breakage in travelling. Talc, however, is expensive, and in its place sheets of acetate of cellulose (sold as "cellon") could be used for the roof of the case. This material is quite transparent, tough and non-inflammable.

6. **Boxes.**—Many plants with woody stems, which are capable of supporting drought for some weeks, may be packed in boxes, fixed at the ends or along the sides by means of battens so that the tops all point towards the middle of the box and are free. The roots should first be tightly enclosed in a layer of moss, wood shavings, or fibrous material, such as banana leaves, and the plants can then be arranged so that they will not move. A few small holes in the sides or lid of the box will provide ventilation. Such plants as Roses, Rhododendrons, Pelargoniums, Begonias, and Orchids have been sent successfully from Kew to distant countries, even to Australia and New Zealand.

Cases or boxes containing living plants from the East Indies Australia, &c., which are sent *via* the Suez Canal should be despatched so as to arrive in England in September, October, April, or May. The heat of the Red Sea has often proved fatal to plants passing through it during the summer (June, July, August).

Cases and boxes from America, the West Indies, &c., may be sent so as to arrive at Kew any time from the beginning of May to the end of October.

No cases containing living plants from the tropics should arrive in England in the winter months, viz., from November to April.

II.—MUSEUM DEPARTMENT.

Among the objects which should be collected for Museum purposes are:—

1. **Fruits and Seeds,** especially those which are of large size, or possess any peculiarity of form or structure entitling them to notice. Many of these are naturally dry and require little care previous to packing. Seeds that are edible, of medicinal value, or sources of oil, should, if possible, be gradually dried and packed in canvas bags. Naphthalene or carbon bisulphide should be placed with any food grains liable to attack by weevils, and such seeds should be packed in tin boxes. Those fruits and seeds, &c., that, when ripe, burst open into valves, or separate by their

scales, such, for instance, as pine-cones, should be bound round with pack-thread. Soft and fleshy fruits can only be preserved in wide-mouthed bottles, or jars, or casks (according to size) in alcohol, as rum, arrack, or in diluted pyroligneous acid or strong brine. Formalin is also a very convenient medium, a 5 per cent. solution, or 20 parts water to 1 of formalin, being generally sufficient. Fruits and fleshy plants will also travel well if soaked in spirit or formalin for a few hours and then wrapped in cotton wool saturated with either of these preservatives and packed in tin boxes. In this way Postal and Customs requirements can be complied with.

2. **Entire Plants,** or parts of them. Many have a very fleshy character and ought to be preserved entire in alcohol; or, when very large, portions of the stems and branches (according to their size) with flowers and fruit may be adequate. This method is desirable for such plants as Palms, *Stapelia*, *Rafflesia*, and others of a similar type.

3. **Trunks of Trees,** portions and sections of them, especially when they exhibit any remarkable structure: as Palms, and many other Monocotyledonous plants, and Tree Ferns. Specimens of wood should be in sections, a foot or more long, and about the average diameter of the tree. The kinds used in commerce for veneering, cabinet-work, or other useful purposes, or such as recommend themselves by their beauty, hardness, or any other valuable quality, are particularly desired. The scientific or other names, if known, should be attached, and specimens of the leaves and flowers should be sent so as to admit of their identification.

4. **Gums and Resins, Vegetable Waxes,** especially those employed in the Arts or in Domestic Economy.

5. **Dye Stuffs** of various kinds.

6. **Medicinal Substances.**—These are of much importance, and merit the attention of travellers in every country. With regard to many it is not yet known, except by the natives who collect and prepare them, what are the particular plants that afford them, and how they are prepared.

7. **General Products of Vegetables**; in the state of the raw material, and manufactured. It would be extremely difficult, not to say impossible, to enumerate all of these which a Museum ought to contain; but the enlightened traveller can form a pretty correct judgment. Such as are useful to mankind cannot fail to be interesting. It would be idle to send every well-known object of this kind, tea, sugar, coffee, cocoa, chocolate, pepper, textiles, plaiting, basket-work, clothing, &c.; but there are states even of these familiar articles which may prove both useful and instructive.

In the case of samples of timber, of various fibres, dye-stuffs,

drugs, or any other vegetable product, it is of the first importance that there should be sent along with each example a dried specimen of the leaves and flowers of the tree or plant affording the same, marked distinctly with a corresponding number, so that the source of the product may be scientifically determined. Owing to the absence of such dried specimens accompanying the timbers, drugs, fibres, &c., which have been sent to the Royal Botanic Gardens, a large number of interesting articles have been rendered absolutely valueless from the scientific point of view.

III.—HERBARIUM DEPARTMENT.

The ultimate object of collecting and preserving herbarium specimens should be the advancement of our knowledge of the existing forms of plant life and their distribution, and the deposition of the specimens as permanent records and material for comparison and re-examination.

With that object before him the intending collector will naturally consider what he should collect, and how the specimens should be selected and preserved.

His decision must depend on a variety of conditions, such as the nature of the country where the collecting is to be done and the extent to which it has already been explored, the opportunities afforded to the collector by the mode of his travel, or the circumstances of his residence.

In working out a programme the collector will have to consult the circumstances of his case with the advice of an expert, and in carrying it out he will frequently have to fall back on his own resourcefulness in modifying and adapting the hints with which he has been supplied.

A little consideration will show that even a well thought-out programme and careful selection and preservation of the specimens do not in themselves exhaust the conditions on which the value of a collection depends. The specimens will no doubt carry a great deal of information with them, but many data only known to the collector, and much observation only obtainable on the spot, must be left behind and will be lost if the collector does not provide for their immediate registration. The recording of such particulars as place and time of collecting, circumstances of association, fading colours and vanishing odours, the habits of plants which are too large to be collected entire, relations to the animal world, uses and so on, is generally referred to as "labelling," but in so far as it is frequently done in a notebook—the labels only bearing the numbers which connect the specimens with the entries—it will here be dealt with under the heading "annotation."

The following hints have therefore been grouped into the sections:—(1) The collection of specimens; (2) The selection of material; (3) Preparation and preservation; (4) Annotation; (5) The gathering of the specimens in the field; and (6) Packing. Each section has been prefaced by a general statement of the guiding principles.

I. The Collection of Specimens.

To many intending collectors the goal of ambition is probably the discovery of new species or even new genera, and in a botanically new or little-explored country such endeavours will no doubt be crowned with success. The collector will not, however, be able to distinguish between new and known forms, as even for the expert this would hardly be possible. The next impulse would probably be to collect everything and everywhere. But it is obvious that this plan, although advantageous in a new country and under favourable circumstances, will usually be impracticable. In well, or even fairly well-explored regions, such a collector would tend to be doing again work previously accomplished, and would miss much that is actually within his reach did he but know what to look for, and where to seek it. In other words, he should try to inform himself at the outset as to what is known about the flora of the country which is to form his collecting ground and what may be expected from it.

The collector working in well-explored countries must not expect discoveries of new forms, but rely on detailed observations concerning distribution and association for which his specimens will form the material to connect them finally with the correct names. Facts of distribution and association may, to a certain extent, be gleaned from any well-annotated set of specimens, but the result will be much more satisfactory if the collecting is done systematically with a view to provide material for the solution of some problem.

From these general considerations arise the following rules or hints concerning the scope and direction of collecting.

A.—If resident or making a long stay in a country.

1. In *well-explored countries* efforts should be concentrated on collecting material for the study of the distribution of plants or the composition of the more prominent types of vegetation, cultivated races, or special problems connected with plant life. Plants connected with the animal world or human economy and folk-lore may also be studied.

2. In *little-known districts of otherwise fairly well-explored countries* general and exhaustive collecting will be of value, but it is improbable that many discoveries will be made.

3. In *little-explored or unexplored countries* extensive collecting, including *all* classes of plants, will be of great importance, and will almost certainly yield new plants and important facts of distribution.

(*a*) The country should be reconnoitred in order to get a grasp of the general features of the flora, and all the prominent types of vegetation should be collected.

(*b*) Then some typical or particularly diversified area or areas should be selected and an endeavour made to exhaust the flora.

B.—If moving by easy stages and with a fair amount of available time.

4. In *well-explored countries* work as under 3 will still be

useful, but it should be more specialised and concentrated, so that the results obtained can be compared and co-ordinated.

5. In *little-known districts of otherwise well-explored countries* general collecting will still be useful, although it cannot be exhaustive. Attention should be directed mainly to the less frequent and less conspicuous plants. Otherwise work as in 3 may take its place.

6. In *little-explored or unexplored countries* collecting should, in the first place, aim at all that appears as a prominent feature in the vegetation. Any time available beyond that might be given to general or specialised collecting, according to circumstances.

C.—If travelling rapidly and with little time, or only odd intervals available.

7. Collecting in *well-explored districts* will not be of any particular value.

8. In *little-explored or unexplored countries*, collectors, even if working quite casually, may find a rich field, but some sort of method should be followed, and it will certainly enhance the value if, for instance, attention be concentrated on the most marked plants at hand, on trees and shrubs, on gregarious species, on field crops, and so on.

D.—Outposts of vegetation.

9. At *extreme altitudes or latitudes, or in small uninhabited islands and oases*, which are widely separated from land covered with vegetation, every kind of plant, phanerogamic or cryptogamic, should be collected, even though the specimens procurable may not bear organs of reproduction.

II. The Selection of Material.

It is hardly necessary to point out that a specimen, in order to be of any value as an object of study, or as a record, must be in a state which permits us either to determine it—that is, to assign it to some known species, or to exclude it positively from all the species known to us—in which case it will have to be described as new. As the classification of plants rests in the first place on the organs of reproduction, flowers and fruits, but pre-eminently the former among the higher plants, and spores and spore-carriers among the lower plants, must be collected. It is true that the vegetative organs, especially the leaves, of many plants are so specialised that they alone may enable the expert to name the plant, but the non-expert collector will never be in the position to know when this may be the case. Collecting barren specimens amounts, therefore, generally speaking, to a waste of the time of the collector as well as of the expert. Yet there are exceptions when it is justifiable, as in the case of plants of great prominence in the vegetation of more or less new countries, of very special biological or economic interest, or such as have been described above as outposts of plant life.

Although classification rests primarily on the organs of reproduction, the vegetative parts must not be neglected. They fre-

quently yield, among nearly-related species, the most tangible criteria, or afford a ready means of recognising affinities. More than that, they must be available if we are to arrive at a complete knowledge of a species. For that purpose, to speak only of the flowering plants, leaf and stem and root are organs as essential as flowers and fruits. The ideal specimen would represent the plant in its normal state, with all its parts, and the parts chosen so as to show their arrangement as well as the principal stages of development and the range of their variation. Though this ideal may not be easily attained it should be kept in mind as a guiding principle in selecting specimens.

The collector should make it a rule, to give time to selection and subsequent preservation rather than to aim at a great number of specimens, which will probably be less satisfactory and may, in the end, have to be thrown away. As long as the collector has to deal with small plants which do not exceed the dimensions of his collecting outfit, and can therefore be taken up entire, he will only have to look for healthy average individuals which bear flowers or fruits or spores, and he may add to them some in earlier stages of development. If they are not much larger, and can be doubled up, he may still do the same. But if they are too large to be folded—as many herbs, ferns, certain seaweeds, most shrubs and all trees—he will have to resort to a selection of sections to fit his paper or his bottles, and he may find it difficult to cut pieces not too large and yet representative of the plant. In those cases it will be best to choose, in the first place, a piece exhibiting the organs of reproduction in their natural connection with as much of the vegetative parts as possible, and then to supplement it, if necessary, by other sections which contain the missing parts, care being taken that the sections are made from the same individual, or if this be impossible, at least from individuals which are of the same kind. Such detached specimens must be so marked that their connection cannot be lost or doubted. But even so, some characters, such as habit, dimensions, etc., will not be shown by the specimens, however well selected, and must therefore be supplemented by notes or sketches.

The following essential points may be summarised as rules for selection.

1. Select specimens so that they shall be as *representative of the plant* as possible.

2. *Do not collect specimens without organs of reproduction*, except in very special cases, such as in those of prominent members of the vegetation of a new country, of plants of special biological or economic importance, or of plants growing at the outposts and limits of vegetable life.

3. Select specimens so that they exhibit their organs of reproduction in connection with as much of the vegetative parts as possible, and, unless unavoidable, do not detach flowers and fruits except with the object of supplementing the specimen.

4. In the case of small plants, take up whole individuals with the root, selecting the most typical of their kind.

5. In the case of larger plants, cut specimens, in the first

place, so as to satisfy rule 3, and if not sufficiently representative, supplement by material from other parts of the plant, noting carefully their connection.

III. The Preparation and Preservation of Specimens.

Specimens should be so preserved that their distinctive characters may be retained and that the minute structure of the flowers and other organs can be subsequently examined. The immediate object is to preserve them from the attacks of fungi (moulds) and insects with a minimum of injury to the general structure of the plant. Preservation may be effected by either the dry or wet methods, or by a combination of both.

A. The dry method.—Plants may be dried in various ways, but for our present purposes only methods of drying under pressure between absorbent paper and of drying in the air need be described. The former is most generally employed for "exsiccata" or herbarium specimens, as usually understood, as it has the immediate advantage of reducing the bulk of the specimens to a minimum, of preventing their curling or excessive shrinking and generally of fixing them in such a position as to exhibit all their parts in their natural connection. Drying under pressure, however, is not applicable to all specimens, either because they are woody and not compressible, too succulent, or again so delicate that they would be liable to be crushed out of recognition. Of such specimens some must be air-dried, whilst others can only be preserved in fluids. Further, it frequently happens that only certain parts are suitable for drying under pressure, and in such cases the pressed material will have to be supplemented by material dried in the air or preserved in fluids. Then, again, specimens which in the first instance had to be preserved in spirit may subsequently be dried under pressure.

Drying under pressure.

The chief points which must be considered in connection with the drying of plants under pressure between absorbent paper are (1) the kind of paper and the mode of pressure, (2) the nature of the specimens, and (3) the conditions arising out of the ultimate destination of the specimens, that is their deposition in a herbarium.

The Paper.—Drying of specimens must be effected quickly and sufficiently completely to prevent decomposition, the development of moulds and the ravages of insects. The absorbent paper must be non-sized and soft enough to apply fairly closely to the specimens, but also sufficiently strong not to disintegrate when impregnated with the moisture taken up. Nor must it be so bibulous as to draw moisture freely from the air. Many kinds of packing papers, old newspapers and most blotting papers will answer as substitutes for those which are sometimes manufactured especially for drying plants. A few drops of water sprinkled over the paper will, by the readiness with which they are absorbed, show whether or not the paper is suitable for drying

purposes. As the paper absorbs moisture it becomes less efficient, and this tendency may be counteracted by placing the specimens between layers of several sheets of paper, but it is better to change the damp papers frequently, and the oftener this is done the more quickly will the specimens become dry. Specimens under pressure, however, except those that are particularly rigid, soon become limp and their more delicate or succulent parts tend to curl up when they are transferred from the damp to a dry sheet of paper, and therefore have to be straightened and flattened out again. As this operation cannot always be successfully performed and in any case involves a waste of time, the difficulty may be overcome by placing each specimen in a folded sheet of thin paper ("retainer"), leaving it there until it is dry and changing only the intervening sheets of stouter or more absorbent paper ("pads or driers") as often as may be necessary. To facilitate the changing of the "pads," the sheets making them up should be stitched together and be of a colour different from that of the "retainers." Should fuller padding be necessary for more bulky or succulent plants two pads of "driers" may be used between each pair of "retainers." The use of easily distinguishable "retainers" or "pads" has the further advantage that the changing of the paper becomes a purely mechanical procedure which can be entrusted to unskilled hands, particularly when the free edges of the "retainers" are pinned together or folded over so that the specimens or loose parts cannot slip out. To ensure the full action of the "pads" they must, of course, be perfectly dry when taken into use, and if they are at the same time moderately warm, they will be still more effective. If well dried after each change they can be used over and over again. How to dry them must, of course, depend on circumstances. The sun may do it one day, whilst artificial heat and ventilation may have to be resorted to the next day.

Packets containing fresh specimens must not be placed immediately on others with plants already half dry. They should be either kept apart or a broad sheet of millboard should be inserted between them. Similarly, slowly drying specimens should be made up in separate packs with more ample padding.

Quite apart from the action of absorbent paper under pressure, the process of drying can be accelerated by applying heat and ventilation to increase evaporation from the packs containing the specimens; but if artificial heat be used, care must be taken that the drying is not carried so far as to make the specimens too brittle. Good results are obtained if small packs are hung up in the sun or over a fire, and if the driers are also frequently changed.

The pressure.—Pressure may be applied in various ways. It should be light at first, but be increased more or less rapidly as the specimens become dry, so as to prevent undue shrinkage or shrivelling. At the same time it must never be carried so far that the softer or more delicate parts are in danger of being crushed or of becoming glued to the paper. In fact, the collector may make it a rule that too little pressure is less harmful than

too much, since the specimens will eventually have to be examined externally and internally. If pressed too hard, the surfaces may become altered beyond recognition, hollow organs may be crushed, and overlying parts so cemented together that they can only be torn asunder. Specimens well dried under moderate pressure will be found to exhibit not only the external characters well, but also, as a rule, to resume, when soaked, their original shape, so that they can be studied in detail. Trouble, however, may be caused owing to the unequal thickness or consistency of different parts of a specimen, as for instance where thick stems are associated with thin leaves, or coarse, dry leaves with delicate flowers. In those cases, extra padding with small pieces of paper or of wadding must be introduced within the "retainer" so as to distribute the pressure more evenly or more in accord with the requirement of the several parts. These paddings are, of course, of a permanent nature, and should not be removed until the drying is completed.

The requisite pressure may be applied by weights, or better, by means of buckled straps, and it should be evenly distributed. A sufficiently strong board should be placed on the top of each pack of paper to carry the weights, or if strapping be adopted, the packs should be placed between two such boards, or preferably trellis-like gratings ("presses") made of wood or wire. When straps are used to apply pressure, gratings are more useful than solid boards, because they are lighter, and admit of evaporation, and the straps, which may be of leather or strong webbing, render the regulation of the pressure an easy matter. The gratings may be made of strong wire or of wooden staves or laths laid crosswise so as to leave openings of about 1–1½ inch square. Generally, wooden gratings will be sufficient, and they have the double advantage that they are light, and can easily be made wherever wood is at hand; but where the gratings are liable to be exposed to very rough handling, they should be of strong wire. A screw press should never be used. When moving about, the collector should have his drying apparatus as simple as possible, so that repairs and replacements of worn-out or lost parts can easily be effected.

Trellis or grating presses will answer well under almost any circumstances. They can easily be moved with their contents, suspended in the sun or over a fire, or be stood up on their narrow sides so as to expose the maximum surface to the air. On the other hand, drying under weights is only practicable when the collector is in residence, or able to stay at one place until the drying is done.

The nature of the specimens.—Most plants lend themselves more or less readily to drying under pressure between absorbent paper without any special precautions. Not a few, however, require some preparation before they can be pressed, while others are altogether unsuitable for that process, either in part or in their entirety.

All Algae, with the exception of certain calcareous, slimy or

gelatinous forms, all dry fungi, if they are not too bulky, many lichens, all mosses and liverworts, ferns and fern-allies and most flowering plants can be dried with no more preparation than a judicious adjustment of their parts, or an occasional thinning out to avoid too much overlaying. A little padding may be needed in some cases to ensure an even distribution of the pressure, or the halving of a thick stem or branch, and occasionally it may be found necessary to split a thick stem, in order to avoid having too bulky a specimen in the press. Should it be found necessary owing to the delicacy of some parts of a specimen to press them separately, and under different conditions, care must be taken to give them the same number as that belonging to the specimen from which they were taken.

Where the parts of a specimen are too large for the drying paper, even if doubled up, they must be cut up and dried separately, but as a rule it is not necessary to preserve all sections, as long as those selected allow of the reconstruction of the whole organ with the help of notes and sketches. This applies especially to large leaves and inflorescences. In the case of very large simple leaves it will usually suffice to dry enough to show the characters of the base and the tip, and a section taken from the middle from margin to margin, or from the midrib to one of the margins, noting at the same time the distances between the parts selected. Similarly in pinnate or compound leaves it will suffice to preserve enough of the petiole or rhachis of the leaf to show the mode of arrangement of the divisions, and of the latter such as will bring out the transition in shape and size from the base to the apex, or from the centre to the sides. Dimensions and numbers of parts not demonstrable in this way will, of course, have to be noted. The same applies to out-sized inflorescences.

Greater difficulties arise where the specimens or their parts are too bulky for pressing. Whenever they lend themselves to air-drying they ought to be treated in that way, and carefully numbered; and, where possible, sections should be retained in connection with the pressed specimen. Should air-drying be impracticable and the specimen not too succulent, sections must be made for pressing, the sections being chosen so as to allow of reconstruction when supplemented by notes and sketches. As there will be much shrinkage and some distortion in sections of succulent specimens, care should be taken to note the dimensions in the fresh state, or prints may be taken from the fresh sections on paper by daubing one side of the section with ink or some other staining material and pressing it firmly against a piece of paper. In this way excellent prints can be obtained of cross sections of the stems of cacti or of the leaves of agaves. Succulent plants or succulent portions of plants are frequently a cause of great trouble to the collector because they give off their moisture very reluctantly, and if subjected to great pressure, get crushed. It is best to kill such plants or succulent objects by dipping them either in boiling water or immersing them for some time in spirit, after which the specimens will readily dry in the

press; but the pressure will have to be applied very gently at first or they will be crushed. Excellent results may be obtained in this way with the most recalcitrant material, particularly if spirit be used; as the spirit can be used many times over no great supply is required.

Certain aquatic plants with limp stems and finely divided leaves, as, for instance many Ranunculi and Utricularias, or Algae with a much divided thallus, are very easily dried between absorbent paper, but they cannot be spread out properly on a dry sheet because they collapse, when taken out of the water, into shapeless tufts and bundles. They should be caught up on a sheet of stiff paper under water, when they can be spread out easily, and then by drawing the sheet slowly and slantingly out of the water with the base of the specimens towards the operator they may be fixed on the paper in their proper position and placed in the "retainer" where they will dry rapidly with a moderate application of pressure.

Herbarium conditions.—The size of the paper on which the plants are mounted varies in different herbaria, but that in use at Kew measures $16\frac{1}{2}$ in. (42 cm.) by $10\frac{1}{2}$ in. (26·5 cm.), which is rather smaller than that of most of the other large herbaria. For large ferns, palms, screwpines, etc., a larger paper is sometimes used, $21\frac{1}{2}$ in. (54·5 cm.) by $14\frac{1}{2}$ in. (36·5 cm.); but most collectors with limited means of transport will have to fit their presses to the smaller size. Quite a small-sized press can be used where collecting is confined to small plants only, as, for instance, to mosses, or to the low herbs of arctic regions or high mountains.

Stress has repeatedly been laid on the necessity for selecting representative specimens that exhibit all the parts of the plant as far as this is possible within practical limits, and of preserving them so as to allow of their subsequent external and internal examination.

For this purpose an ample quantity of flowers and fruits must be provided with the specimens, especially when these organs are small. This can generally be done quite easily, by drying an extra supply of flowers and fruits and placing them in capsules made of absorbent paper in the "retainer" along with the specimen and giving them the number of the specimen. But the collector who wishes to assist the herbarium worker to the full should cut open or divide lengthwise at least some of those flowers which he intends for the supplementary capsules, and dry them flattened out. The same applies to certain compact inflorescences, such as the "heads" of composites or the spadices of Aroids, and to many fruits and infructescences. Specimens may be almost useless unless the collector proceeds in some such way, as for instance, in the case of the Balsams, and still more, of many Iridaceous, Zingiberaceous and Marantaceous flowers, the parts of which become frequently quite inseparable and indistinguishable when they are pressed whole.

Drying in the air.

It may sometimes be necessary to dry in the air certain specimens or parts of specimens which are too bulky to be pressed

except by means of sections. This may apply to whole plants, as in the case of cushion plants, Balanophoras, or to peculiar stems, as those of cacti or cactoid Euphorbias, or to tubers, rhizomes, and bulbs, or to large fleshy flowers, or, and this is most often the case, to large fleshy fruits. It would be best to preserve such fruits by the wet method, but it is probable that, as a rule, some method of drying will have to be resorted to wherever the structure is sufficiently strong to prevent a complete collapse. In many cases mere exposure to the sun or over fire will be sufficient, but to avoid distortion and rupture the drying must not be forced. In certain cases, however, the fruits will dry so slowly that decomposition or destruction by insects in the inner parts of the specimen may occur. In these circumstances immersion in spirit previous to drying will generally accelerate the process and also destroy any fungus germs or insects that may be present. It may be found advisable to prick and also to divide any object immersed in spirit. The drying in air should not be carried so far as to make the specimens too brittle or too hard. In fact, in not a few cases it will be found that the specimens have when half-dry become sufficiently tough and reduced in bulk to be pressed without harm. This applies also to Agarics and similar fungi which cannot be laid into the press when fresh, nor preserved with advantage in fluids. They have to be slowly dried in the sun or over fire until they are tough enough to be pressed gently, and a short bath in spirit before pressing will be useful in order to destroy any grubs or insects in them.

B. The wet method.—There will always be a few objects which will defy all attempts at preservation by pressure, or by drying in air, since their soft structures will lose so much of their natural shape and consistence that they will be useless for subsequent examination. Such objects will have to be preserved in a suitable fluid, and this also applies to specimens which are intended for minute examination.

The fluids which can be used are Alcohol, Formaldehyde or Formol, and strong solutions of common Salt in water.

a. Alcohol.—Alcohol, if "proof" spirit*, should be diluted by adding 1 volume of water to each volume of spirit, as the specimens would otherwise become too brittle and would suffer in transport.

b. Formaldehyde.—This fluid has the same preserving properties as alcohol, but the objects may get too soft if left long in it. On the other hand, it has this advantage over spirit, that the same volume will go much farther. Commercial formaldehyde is a 40 per cent. solution which before use must be diluted down by the addition of water to 4 per cent. In most cases a 2 per cent. solution will be sufficiently strong. A quart of formaldehyde will therefore yield as much preservative fluid as 1 to 2 gallons of spirit. As formaldehyde in solution or in vapour is a strong

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* Proof spirit is alcohol of 50 per cent. strength and ordinary whiskey is about "proof" strength. For the preservation of specimens alcohol of 20–25 per cent. strength is suitable.

irritant for all mucous membranes, care has to be taken in its use.

c. Salt.—Should other fluids fail, a concentrated solution of salt makes a fair substitute. If fairly concentrated it answers well for succulent fruits or stems and similar objects, provided care be taken that they are completely immersed in it.

Unless the collector enjoys special facilities for transport, considerations of space and weight will be very important and the receptacles will have to be selected so that they pack well. Tubes of two lengths (in the proportion of 1 : 2) and diameters from $\frac{3}{4}$ to $\frac{1}{2}$ in. and jars from 2 to 5 in. wide will generally be found to answer in most cases. The tubes should be provided with well-fitting cork stoppers, the jars with such patent lids as are used for liquid preserves. Spirit and formaldehyde may be carried in glass, earthenware or metal vessels, but salt and water can only be used in glass or earthenware receptacles.

The specimens should always be wrapped first loosely in soft paper and tied round with thread, with a label placed inside. Otherwise they will get mixed up and injured in transport. The fuller the vessel the better, as the little parcels will thus be kept in position, but it will be advisable to distribute the specimens, so that light specimens are not placed together with heavy objects. Large succulent fruits or stems need, as a rule, only be immersed for a few days in spirit or formaldehyde, and can then be packed up in sawdust, moistened with the same fluid in a well-closing box or tin, and posted home at the first opportunity.

Schweinfurth's method.—The method invented by the famous traveller and collector, Dr. G. Schweinfurth, consists of the combination of preservation in spirit or spirit vapours and subsequent drying. The plants are laid into folded sheets of paper or on single sheets of paper as if they were intended for immediate drying, the sheets being piled up without "dryers" between them, and then tied fairly tightly into bundles 2 to 3 ins. thick. The bundles are then put into a tin and saturated with spirit, after which the tin is soldered up. The vapours forming in the hermetically sealed tin are quite sufficient to preserve the specimens for a long time. When the tin finally reaches home the specimens are dried in the ordinary way. It is obvious that this process has great advantages, but on the other hand it is more expensive and adds to the difficulty of transport. During a prolonged rainy season when no fires are available for drying, or in cases where the collector has not the time to attend to the sometimes laborious process of drying, or when he travels in boats where there is no accommodation for drying his papers, and in other similar circumstances, this method may be the only possible way of preserving specimens. The tins should be about 1 in. wider and about $\frac{1}{2}$ in. longer than the paper, whilst the depth may vary from 6 to 8 in. If they are much deeper they will get too heavy, or by the time they have to be closed and soldered up there may not be enough material to fill them. The tins must be open at one end, which should be provided with flaps prepared for the soldering. These flaps should project about 1 in.

beyond the end of the tin, so that they can be turned down at right angles to the sides and thus form a support for the lid on to which it can be soldered. In order to reduce the volume of the outfit, the tins may be made in several sizes, so that they can be packed together in "nests," and the innermost tin may then be used as a receptacle for paper, the appliances for soldering, etc. The collector who intends to use such tins should remember to learn how to solder on a lid. As the paper in this process serves mainly to separate the specimens and to keep them in position, almost any kind will answer as long as it is not too thin or too soft.

The tins are filled by one bundle being placed against one side, then another against the opposite side, and the third bundle is pushed in between the two; the three bundles should so fill the tin that any shifting is impossible. The spirit or formalin is then poured over the paper until it is thoroughly saturated. A volume of liquid up to one-sixth the capacity of the tin will be found sufficient. The tins when closed must be packed in wooden cases if they have to be sent long distances, but the collector may prefer to open the cases and to dry the specimens in presses as soon as he finds himself under suitable conditions. In that case he will have to proceed very much as he would if the plants were still fresh; but he should remember that plants thus pressed dry much more quickly and more completely. Hence they require less pressure, and if dried over fire, tend to become very brittle.

IV. The Gathering of Specimens in the Field.

It is obvious that it is quite impracticable to put each specimen into the press or spirit tube immediately after it has been taken up, although this should be done in the case of exceptionally delicate objects. As a rule the specimens as they are gathered are placed in a receptacle as the collector goes along, and kept there until he arrives at his camp at the end of the day. A portfolio with a filling of sheets of paper in which the plants can be immediately laid out, or a vasculum in which the plants can remain in a fresh condition, may be used for this purpose.

The vasculum.—The vasculum is a case made of tinned sheet iron, longer than the maximum length of the specimens admissible with regard to the drying outfits, elliptic in transverse section, closed at both ends, and provided with a lid which turns on hinges. It is generally furnished with a strap to be borne over the shoulder. It is very convenient to have a partition with a separate lid at one or both ends to receive small objects, and particularly such as require special attention. The tins should be painted some light colour so as to reduce the absorption of heat. A vasculum should not be so large as to be inconvenient. The specimens must be placed in the vasculum with some care so that they do not get too much entangled or damaged in transit. Heavy objects should not be mixed up with the ordinary light herbaceous growth, nor must roots and rootstocks be laid in with more than a minimum of soil attached to them. Small and deli-

cate specimens should be protected by wrapping them up loosely in soft paper. On hot days a very moderate sprinkling of the contents with water may be helpful to keep the plants fresh.

The portfolio.—Portfolios are best made of two stout pieces of cardboard covered with some waterproof material, and slightly larger than the drying paper used, with a pair of buckled straps passing through slits and over the side which is intended to serve as back, so that the whole can be opened like a book, and the portfolio should be filled with a quantity of "retainers." It may be carried on a strap hung over the shoulder or in the hand. The specimens may be either laid in as they are collected, or a better plan is to place them at first in the vasculum, and transfer them to the portfolio from time to time during the course of the day. Such a combination of vasculum and portfolio gives the best results, and is probably the most convenient method of gathering. If the collector be accompanied by porters he may take a pair or more of light wooden presses with him filled with "retainers," and place the contents of the portfolio in a press in exchange for a fresh set of "retainers." At the end of the day's collecting it will only be necessary to interpolate the "pads" or driers in the press between the "retainers" and to tighten the straps.

Certain small and convenient improvements, such as a pocket on one of the outsides of the portfolio to hold labels, a note-book, etc., or a waterproof wrapper clipped under the straps, can easily be added according to the collector's requirements.

Tubes may be carried in strong cardboard cases or tins in the coat pockets, and the preserving fluid may be added at the end of the day. In this case, too, it will usually be advisable to wrap the objects in soft paper, adding the number before inserting them in the tubes.

V. Annotation.

It is a matter of the utmost importance that the conditions under which a specimen has been collected should be correctly and fully registered. The details required are the locality, date, altitude, local distribution, frequency, and association of the plant as well as those characters which are not always demonstrable in the dried specimen, such as colour and scent of flowers, etc. To these data may be added observations of various kinds, such as uses, vernacular names, and so on. The notes ought to be made at the time that the specimen is collected, particularly if much collecting is to be done during the day, in order to prevent the possibility of mistaken recollections. This task will be greatly facilitated if it be done methodically, and the best plan seems to be to enter all the notes in a pocket notebook with numbered pages and provided with easily detachable slips each bearing the same number in clear print. As the collector will frequently lay in duplicates, or have to divide a large specimen, or to detach certain parts, all of which ought to have the same number, it is desirable that each page should have several such slips attached to it. A specimen page of such a

collector's book, with details filled in, is shown in the illustration. The book should fit conveniently into a pocket. When particulars of a specimen have been duly noted, as many slips as may be required should be detached and fastened to the specimens. The slips may be provided with two cuts so that they can easily be slipped over the stem of a specimen. By this or some other suitable method of attachment there should be no fear of the loss of the numbers, or risk of the specimens becoming mixed, particularly if "retainers" are used. Another advantage in these printed slip numbers lies in their clearness, and in the comparative indestructibility of their numbers, whether they are exposed to the ordinary moisture of the drying press or to immersion in fluid. If the number should have to be written—and the same applies, of course, to any written label which is laid in with the specimen—no ink or ink pencil should be used, but a black, soft pencil, or a red or blue crayon.

Some collectors will find it useful to have certain items printed in their notebook such as "vernacular name," "altitude," "colour," "height," "date," etc., but too many of them tend to confuse rather than help, and it is best to print in only the more important items, such as locality, habitat, altitude and date, leaving a large space for "observations."

FARSISTAN EXPEDITION: 1910. J. F. SMITH. 250

Date.—*7-6-1910.* Alt. *9500′*

Bot. Name.—*Euphorbia.*

Vern.—*Daracht-i-sang.*

Loc.—*Pir-i-zan pass.*

Hab.—*On rocky slopes, very common, mostly associated with Ferulas and Amygdalus.*

In tufts up to 2′ high; lower leaves crowded, glaucous; upper, like inflorescences, yellowish green, in striking contrast to the former. Involucral glands deep purple. Sheep do not touch them. Herb gathered by natives. Exact uses not ascertainable. Frequent throughout Kuh-Bil range.

J. F. Smith.
250

J. F. Smith.
250

J. F. Smith.
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J. F. Smith.
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These field notes must not be confused with the labels which will eventually have to be issued and distributed with the specimens. The labels have to be written up from the field notes, and should be of a pattern similar to that shown in the figure. The heading should indicate the country where the collection was made and perhaps the title of the expedition, the scientific name of the plant (or a blank space for it), the exact locality, with a reference to the nearest large town, river or mountain, which is likely to be found in a good atlas, the altitude, the date, the name of the collector and any important observations which may be taken from the field notes. The field notes themselves should be deposited with the most complete set of specimens, and

FARSISTAN EXPEDITION: 1910.

J. F. SMITH. No. 250

Bot. Name.—*Euphorbia cheiradenia, P.*

Vern.—*Darachi-i-sang.*

Loc.—*Pir-i-zan pass, between Kasrun and Shiraz, rocky slopes.*

Date—*7-6-1910.* Alt. *9500′.* Coll.—*J. F. Smith.*

if written with care they might eventually be edited and published with detachable pages, printed on one side only, when they would form a valuable addition to the distribution labels and a general source of reference.

VI. THE PACKING OF SPECIMENS.

The specimens when dried must be protected against dampness and the attacks of insects and other animals. They should be made up into parcels, placing a little powdered naphthaline inside, and wrapped up tightly in some waterproof material, such, for instance, as Indian waxcloth. In this way the packets may travel long distances even if no special boxes be available. Herbarium specimens which have been dried in "retainers" may be left in them; but generally these will be required again and the plants will therefore have to be transferred to other paper for packing. For this purpose ordinary newspaper or so-called "strawpaper" will be very serviceable. Should some of the specimens be bulky and likely to press on others which are more delicate and brittle, stouter pieces of paper or pieces of cardboard should be inserted in the bundle where necessary.

XVIII.—ECHIUMS FROM THE ATLANTIC ISLANDS: I.

T. A. SPRAGUE AND J. HUTCHINSON.

(With plate.)

The Echiums of the Atlantic Islands have long attracted attention on account of their arborescent or fruticose habit, and some have been in cultivation since 1777. They formed the subject of a valuable posthumous memoir by Auguste de Coincy, published in 1903.* Among the characters considered important by de Coincy were the nature of the annulus inside the base of the corolla, the relative height of the insertion of the stamens, and

* Bull. Herb. Boiss. ser. 2, vol. iii. pp. 261-277, 488-499.

the length of the style-arms. He draw attention to the existence of gyno-dioecism in several species (*virescens*, *giganteum* sensu lato, *hierrense* and *Decaisnei*), and described four new ones *Webbii*, *exasperatum*, *Bourgaenum* and *gentianoides*), three of which had been proposed by Webb in manuscript. Bolle* had previously described two of Webb's manuscript species (*hierrense* and *callithyrsum*), and *E. leucophaeum*, Webb, MSS., is recognised as distinct in the present paper.

Webb seems to have projected a revision of the Canarian Echiums, and it is to be regretted that this never appeared, as his knowledge of the flora of the Canaries was unrivalled. It is evident, from the names which he left in manuscript, that he would have adopted in certain cases smaller specific units than those formerly recognised by him in the Phytographia Canariensis, and that in no case would he have united species so diverse in habit and with such well-marked technical characters as *giganteum* and *aculeatum*. Christ† regarded these two as distinct species, and described *leucophaeum* as a variety of *aculeatum*, whereas Bornmüller‡ treated *leucophaeum* and *aculeatum* as varieties of *giganteum*, and de Coincy§, who knew them only in a dried state, was unable to distinguish *leucophaeum* from *giganteum* and regarded *aculeatum* as a mere form of the latter. Bornmüller considered that the differences in breadth of leaf, spininess, and indumentum were dependent on local conditions, *aculeatum* occurring, according to him, in the hottest and driest places, *leucophaeum* in somewhat moister localities, and *giganteum* usually in shady bushy places. Neither *giganteum* nor *aculeatum*, however, alters appreciably under cultivation, so that the characters mentioned are relatively fixed; and as they are associated with others derived from habit, the shape of the calyx-segments, the degree of zygomorphy of the corolla, the height of insertion of the stamens, the length of the style-arms, and the nature of the nutlets, the three species can hardly be regarded as otherwise than distinct.

The Canarian species of *Echium* and certain other genera have an extremely restricted distribution, and some which look very much alike in a dried state may be distinguished at a glance in the field, so that they require for their elucidation a knowledge of local topography and observation in the field, in addition to critical work in the herbarium.

During the course of an expedition to the Canaries in the summer of 1913 (see *K. B.*, 1913, pp. 287–299), the writers were fortunate in seeing both *E. giganteum* and *E. aculeatum* growing near Puerto Orotava, Tenerife, the former in a wild state, the latter in the garden of the Grand Hotel Taoro. On visiting the island of La Palma, two other Echiums were seen and collected which obviously represented distinct species. These are

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* Ind. Sem. Hort. Berol. 1867, app. 1, pp. 6-7.
† Engl. Jahrb. vol. ix. p. 128.
‡ Engl. Jahrb. vol. xxxiii. p. 466.
§ Bull. Herb. Boiss. ser. 2, vol. iii. p. 273.

now described for the first time. One, a large bush with pink flowers, occurred in the Barranco de las Angustias on the western side of the island, and has been named *Echium Bond-Spraguei* (pl. fig. 3) in compliment to Dr. Thomas Bond Sprague, thanks to whom the writers were enabled to visit the Canaries; the other, which had white flowers and very short style-arms, was found in the Barranco del Carmen on the eastern side of the island, and has been named *E. brevirame* (pl. fig. 4).

The five species, (1) *giganteum*, (2) *leucophaeum*, (3) *Bond-Spraguei*, (4) *brevirame* and (5) *aculeatum*, constitute a very natural group. To a certain extent they form a series in the above order, the two extremes of which are represented by *giganteum*, which has the broadest and least spinulose leaves and the longest style-arms, and *aculeatum*, which has the narrowest and most spiny leaves, and (together with *brevirame*) the shortest style-arms. If the same series were traceable in the other characters and in the geographical distribution, there would be a *prima facie* case for the union of the five species. A glance at the accompanying plate and text-figure will show that these conditions are not fulfilled. The corolla is more distinctly zygomorphic in species (1) and (4) than in the others; and the broadest and shortest calyx-segments occur in (2). Secondly, the two extremes, (1) and (5), occur in the middle of the area of distribution and the intermediates to the extreme east and west. The most striking point in the distribution is that (5), though restricted in Tenerife to a small area in the north-west, occurs also in Gomera. It is the only species of the *giganteum* group which is represented in two of the islands.

The following key should be used in conjunction with the plate and the descriptions given in the enumeration, as it necessarily contains only a selection of the distinctive characters:—

Leaves narrowly oblanceolate, up to 3·5 cm. broad, almost destitute of spinules; calyx-segments broadly linear; style-arms 2–2·5 mm. long (fig. 1) ... ... 1. *E. giganteum*.

Leaves oblanceolate-linear or linear, up to 1 cm. broad, more or less spinulose :—	
Style-arms 1–2 mm. long :—	
Calyx-segments oblong-lanceolate (fig. 2)	2. *E. leucophaeum.*
Calyx-segments linear-lanceolate (fig. 3)	3. *E. Bond-Spragueï.*
Style-arms 0·2–0·5 mm. long :—	
Lateral calyx-segments shorter than the corolla-tube (fig. 4)... ...	4. *E. breviramе.*
Lateral calyx-segments longer than the corolla-tube (fig. 5)	5. *E. aculeatum.*

1. **E. giganteum,** *Linn. f.* Suppl. p. 131 (1781); Ait. Hort. Kew. vol. i. p. 187; Vent. Jard. Malm. t. 71; J. F. Jacq. Ecl. Pl. p. 93, t. 63; Lehm. Pl. Asperifol. p. 406; Webb & Berth. Phyt. Canar. sect. 3, p. 48, t. 149; Christ in Engl. Jahrb. vol. ix. p. 128; Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465; De Coincy in Bull. Herb. Boiss. ser. 2, vol. iii. p. 271, partim (forma *genuina*).

Folia lata (usque ad 3·5 cm.), anguste oblanceolata, acuta vel obtusa, spinulis fere carentia, nervis lateralibus subtus distinctis, subtus vix sericea. *Calycis segmenta* late linearia, obtusa, medio latiora, in basin paulo angustata; segmenta lateralia corollae tubo breviores vel eum aequantia, 8–9 mm. longa, 1·4–1·6 mm. lata. *Corolla* alba, manifeste zygomorpha, lobo antico ceteris superante; lobus anticus 3–3·75 mm., laterales 2·5–3 mm., postici 2–2·5 mm. longi. *Stamina* antica 6·5–7 mm. supra basin corollae, 6–7 mm. infra apicem lobi antici inserta. *Stylus* tenuiter pilosus, pilis ascendentibus; rami 2–2·5 mm. longi, apice vix incrassati. *Nuculae* deorsum valde angustatae, satis graciles, pauci-echinulatae.

Canary Islands. Northern coast of Tenerife:—In steep places, *Masson* (coll. 1778). Near Puerto Orotava: border of a field by the road between Puerto Orotava and Santa Ursula, young fl. Nov. 26, *Lowe* 99 bis; El Durasno, fl. and fr. May 26, *Sprague & Hutchinson* 98; Barranco Martianez, fl. Jan., *Burchard* 77 (Zürich Polytechn.); on rocks at El Burgado, fl. Feb., *Bourgeau* I. 896; rocks to the east, and hill west of San Antonio, fl. Dec., *Lowe* 98 bis; sea cliffs at La Pata, fl. Dec., *Lowe* 98 bis. Icod el Alto, 600 m., fl. Jan., *Collett.* In shaded rocky places between Icod de los Viños and Garachico, 200 m., *Bornmüller* 2660 (ex Bornmüller, l.c.). Garachico, on maritime rocks, fl. Feb., *Pitard* (Zürich Polytechn.). Risco de Oro, on rocks, 120 m., *Dinn* 5.

E. giganteum may be readily recognised by its broad unarmed leaves, long style-arms and relatively slender pauci-echinulate nutlets.

2. **E. leucophaeum**, *Webb* ex Bourg. Pl. Canar. I. 466, II. 1438; De Coincy in Bull. Herb. Boiss. ser. 2, vol. iii., p. 271, in syn.; sp. nov.

Folia conferta, angusta (usque ad 1 cm. lata), linearia vel

oblanceolato-linearia, acuta, spinulis parvis debilibus margini parallelis, nervis lateralibus subtus indistinctis, subtus sericea. *Cincinni* patuli, sub fructu patentes. *Calycis segmenta* oblongo-lanceolata, subacuta, medio latiora; segmenta lateralia corollae tubo conspicue breviora, 5·5–6·5 mm. longa, 1·5–2 mm. lata. *Corollae* lobus anticus 2·5–3 mm., laterales 2·2–3 mm., postici 2·5 mm. longi. *Stamina antica* 6–7 mm. supra basin corollae, 5·5 mm. infra apicem lobi antici inserta. *Stylus* tenuiter pilosus pilis suberectis, parte media incrassata applanataque; rami 1–2 mm. longi. *Nuculae* crassae, modice echinulatae.—*E. aculeatum*, var. *leucophaeum*, Christ in Engl. Jahrb. vol. ix. p. 128; Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465 (plantis palmensibus exclusis). *E. giganteum*, var. *leucophaeum*, Bornmüller, l.c. 466.

Canary Islands. North-eastern Tenerife: north middle region of the Anaga Mountains, on steep rocks, fl. March 20, *Perraudière;* in dry rocky places of the lower region, fl. March *Bourgeau* I. 53; Anaga Mountains, Barranco de Igueste and Barranco de Draguillo, fl. April, *Schröter;* in rocky places near Bajamar, fl. May, *Bourgeau* I. 466; in rocky places in the barrancos of Bajamar and Bufadero, fl. March, *Bourgeau* II. 1438; La Goleta, fr. June, *Murray*.

E. leucophaeum differs from *E. giganteum* in the shorter, broader calyx-segments, shorter style-arms, stouter, more echinulate nutlets and in the lateral cymes, which are spreading in fruit.

3. E. Bond-Spraguei, sp. nov.

Folia oblanceolato-linearia vel linearia (vix usque ad 1 cm. lata), acuta vel subacuta, spinulis marginalibus et costalibus numerosis manifestis ascendentibus, nervis lateralibus plus minusve distinctis, subtus sericea. *Calycis segmenta* linearilanceolata, subacuta, basi et medio aequilata, a medio ad apicem angustata; segmenta lateralia corollae tubo breviora, 6–6·5 mm. longa, 1·2–1·5 mm. lata. *Corolla* rosea, in toto 12–13 mm. longa; lobus anticus 2·5–3 mm., laterales 2·5 mm., postici 2·5–3 mm. longi. *Stamina* antica 6·5–7 mm. supra basin corollae, 5·5–6 mm. infra apicem lobi antici inserta. Stylus inferne patule pilosus; rami 1–1·2 mm. longi. *Nuculae* (immaturae tantum visae modice echinulatae, cornu valde alato.—*E. aculeatum*, forma inermis, Webb, MSS.

Canary Islands. Palma: western region; Barranco de las Angustias, near Cruz de la Viña, fl. June 11, *Sprague & Hutchinson* 335; on dry rocks, *Webb;* Los Llanos, fl. June 13, *R. P. Murray*.

Murray's specimen is functionally female, as stated by De Coincy (Bull. Herb. Boiss. ser. 2, vol. iii. p. 274). The corolla is 7–8 mm. long, with distinct pockets outside, opposite the insertion of the three posticous stamens. The stamens are very slightly exserted. The anticous ones are inserted 3–3·5 mm. above the base of the corolla-tube, 4–4·5 mm. below the apex of the anticous lobe. The calyx and style-arms resemble those of the hermaphrodite plant. Several of the Canarian species of

Echium are known to be gyno-dioecious. The female plants are comparatively rare. The corollas are smaller than those of hermaphrodite plants, the stamens are included or very shortly exserted, and the anthers oblong-linear, sterile.

E. Bond-Spraguei is allied to *E. leucophaeum* and *E. brevirame*. It differs from the former in its more spinulose leaves, narrower calyx-segments, (usually) shorter style-arms, and in the lateral cymes which are not spreading in fruit; it may be distinguished from the latter by its less zygomorphic corolla, differently shaped calyx-segments, stamens inserted near the middle of the corolla, and longer style-arms.

4. **E. brevirame,** sp. nov.

Folia oblanceolato-linearia vel linearia (usque ad 1 cm. lata), acuta vel subacuta, spinulis marginalibus satis numerosis manifestis ascendentibus, costalibus paucis sparsis, nervis lateralibus plus minusve distinctis, subtus sericea. *Calycis segmenta* lanceolato-linearia, subacuta, a basi ad apicem angustata; segmenta lateralia corollae tubo breviora, 5·5–8 mm. longa, medio 0·8–1·2 mm. lata. *Corolla* alba, manifeste zygomorpha, in toto 12–13 mm. longa; lobus anticus 2·5 mm., laterales 2–2·5 mm., postici 2–2·5 mm. longi. *Stamina* antica 7·5–8·5 mm. supra basin corollae, 4–4·5 mm. infra apicem lobi antici inserta. *Stylus* grosse pilosus, pilis inferne patentibus; rami 0·2–0·4 mm. longi. *Nuculae* crassae, valde echinulatae.—*E. aculeatum* var. *leucophaeum*, Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465, quoad stirpem palmensem.

Canary Islands. Palma: eastern region; northern face of Barranco Carmen, fl. May 31, *Sprague & Hutchinson* 162; Barranco del Rio, fl. June 9, *R. P. Murray*.

The leaves of the two small specimens gathered by Murray are rather more crowded than in typical *E. brevirame*, and the anticous stamens are inserted a little nearer the middle of the corolla. The specific name refers to the very short style-arms, which serve, with other characters, to distinguish this species from *E. Bond-Spraguei*. *E. brevirame* differs from *E. aculeatum* in the less spinulose leaves, the shorter calyx-segments, and the inflorescence.

5. **E. aculeatum**, *Poir.* Encycl. Méth. vol. viii. p. 664; Lehm. Pl. Asperifol. p. 405, t. 5 (ic. mala); Webb & Berth. Phytogr. Canar. sect. 3, p. 50, excl. var.

Folia anguste linearia (usque ad 5 mm. vel rare fere 1 cm. lata), acuta vel subacuta, margine et costa subtus spinosissima, spinis patulis, subtus sericea, nervis lateralibus plerumque indistinctis. *Calycis segmenta* lineari-subulata, acuta, a basi ad apicem angustata; segmenta lateralia corollae tubo longiora, 10–11 mm. longa, 0·8 mm. lata, conspicue spinosa. *Corolla* alba; lobus anticus 2·5–3 mm., laterales 2–2·5 mm., postici 3 mm. longi. *Stamina* antica 7 mm. supra basin corollae, 5·5 mm. infra apicem lobi antici inserta. *Stylus* supra medium incrassatus, pilis ascendentibus; rami 0·2–0·5 mm. longi.—*E. aculeatum*, var. *genuinum*, Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465. *E. giganteum*, var. *aculeatum*, Bornmüller, l.c. 466.

Canary Islands. North-western Tenerife: Montaña de Taco, near Buenavista, *Webb;* at 200 m., fl. June, *Burchard* 260 (Zürich Polytechn.); Buenavista, on sunny rocks, fl. March, *Bourgeau* II. 1431. Gomera: San Sebastian, 300 m., fl. March, *Kuntze;* in dry places, *Pitard* 622 (Zürich Polytechn.); Hermigua, fl. April, *Lowe* 34.

The lateral cymes of *E. aculeatum* are much contracted, and leafy below, and form a leafy corymbose thyrse in which the flowers are half hidden by the calyx-segments and bracts. The cymes are shorter, fewer-flowered and denser than in the other species.

Explanation of Plate.

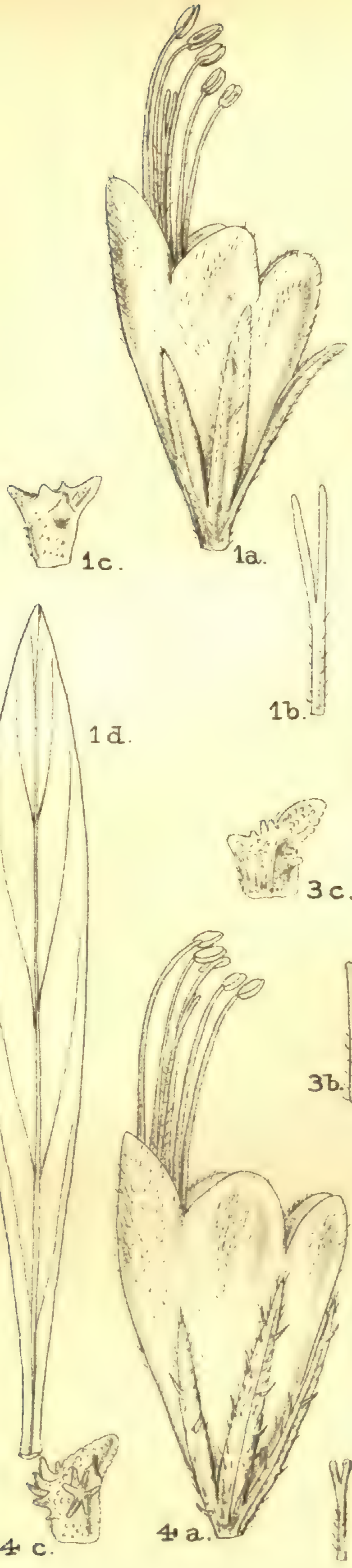
Fig. 1a, flower of *Echium giganteum.*
1b, style-arms.
1c, nutlet.
1d, leaf.
Fig. 2a, flower of *E. leucophaeum.*
2b, style-arms.
2c, nutlet.
Fig. 3a, flower of *E. Bond-Spraguei.*
3b, style-arms.
3c, nutlet (immature).
Fig. 4a, flower of *E. brevirame.*
4b, style-arms.
4c, nutlet.
Fig. 5a, flower of *E. aculeatum.*
5b, style-arms.
5c, leaf.
Flowers, × $3\frac{1}{2}$; style-arms, × 6; nutlets, × 5; leaves, natural size (1d, a small one).

XIX.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamenta VI.

Clematis Kerriana, *Drummond et Craib* [Ranunculaceae—Clematideae]; e grege *C. Vitalbae,* Linn., maxime *C. gourianae,* Roxb., affinis a qua propter foliola breviora basi vix cordata subcoriacea nec chartacea constanter pubescentia nunquam glabrata et antheras duplo longiores loculis omnino parallelis nec basi divaricatis bene distinguitur.

Herba sarmentosa, late scandens, ramis sublignosis angulatis alte inaequaliter sulcatis purpurascentibus pilis ad 0·5 mm. (statu exsiccato) longis cinereo-fulvescentibus crebre vestitis. *Folia* bipinnata vel (inferiora) pinnata, superiora longitudine 15–20 cm. attingentia, pinnis inter se 5–6 cm. distantibus, rhachi ramulis omnino simili plus minusve flexuosa; foliola subcoriacea, terna, terminale quam lateralia semper manifeste majus, circiter 1·8–5 cm. longum et 1·5 cm. latum, ovato-lanceolatum, basi plus minusve oblique rotundatum, rarissime obscure subcordatum, mox in apicem fere cuspidatum sensim attenuatum, lateralia acuta, vix acuminata, omnia subtrinervia, pagina superiore sordide viridia, plus minusve evidenter bullata, pilis albidis subadpressis laxiuscule conspersa, venis primariis manifeste impressis ceteris inconspicuis, pagina inferiore



Canary Echiums.

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pallescentia, venis argute eminentibus satis intra marginem arcuatim inosculantibus, pilis modicis adscendentibus argenteo-canescentibus ad costas longioribus et tunc subbifarie patentibus induta, margine anguste revoluto integerrimo rarius et obtuse lobata, pilis (oculo armato) quasi ciliata. *Inflorescentia* dichotoma, pubescens; pedunculus universalis paulo post anthesin 4·5–7·5 cm. longus, partiales huc illuc bracteis foliosis conspicuis subspatulatis saepius vix 4 mm. longis crassiusculis suffulti; pedicelli circiter 15 mm. longi, tenues, subrigidi, similiter bracteolati, acute divaricati; alabastra sub anthesin pyriformia, obtusa, circiter 6 mm. longa et 4 mm. diametro; flores albidi, odori (ex *Kerr*). *Sepala* expansa denique patentia, oblongo-spatulata, apice obtuse acuminata, externe adpresse tomentosa, intus intricate villosa, albida. *Antherae* muticae, 2·5 mm. vel paulo magis longae, loculis basi omnino parallelis nec divaricatis, cum connectivo lineari et filamentis circiter 4 mm. vel plus longis medio obscure nec basin versus dilatatis, glaberrimae. *Achaenia* (immatura) lateraliter compressa, ambitu dimidiato-fusiformia, nitide castanea, villis argenteis conspicuis fere erectis tecta; styli ad 4 cm. producti, eleganter albide plumosi.

Mê Ka Mi, on bushes and trees by stream, 300 m., *Kerr* 2374.

This may be *C. Vitalba*, Linn., var. *microcarpa*, Franchet Pl. Delavay, based on *Delavay* No. 2984 in hedges at Tapintze, Yunnan. The following are also very closely allied:—Tachienlu, *Pratt* 272, Mengtze, *Hancock* 252, Red River, *Henry* 10919, 10919A, S. W. China, *Monbeig* and Upper Burma, Shan States, *Manders*.

Gomphandra pauciflora, *Craib* [Icacinaceae]; a *G. nyssifolia*, King, inflorescentia laxiore, ovario glabro, a *G. javanica*, Val., fructu haud sulcato distinguenda.

Arbor sempervirens, circiter 12 m. alta (ex *Kerr*); ramuli primo puberuli, mox glabri, cinereo-corticati. *Folia* oblongo-oblanceolata vel fere oblonga, apice acuminata, obtusa, basi plerumque parum inaequilatera, late cuneata, circiter 9–11 cm. longa, 3·2–5·3 cm. lata, chartacea, glabra, nervis lateralibus utrinque 5–7 supra conspicuis subtus prominulis, costa supra impressa subtus prominente, nervulis subtus subconspicuis, integra, petiolo 0·9–1·3 cm. longo supra canaliculato glabro suffulta. *Cymae* laxae, pauciflorae, ex axillis foliorum delapsorum ortae, pedunculo communi circiter 6 mm. longo suffultae; pedicelli 3 mm. longi, ut pedunculi sparse breviter adpresse albo-pubescentes. *Fl.* ♂. *Calyx* truncatus, integer, 0·75 mm. altus. *Corolla* alba (ex *Kerr*); tubus 2 mm. longus; lobi 6, e dorso visi deltoidei vel anguste deltoidei, ad 1 mm. longi, apice acuminati, acumine horizontali circiter 0·75 mm. longo. *Filamenta* 4 mm. longa, intra supra medium fere ad apicem dorsoque summo apice pilis longiusculis albis papillosis instructa, antheris parvis. *Pistillum* rudimentarium 1·5 mm. altum, glabrum. *Fl.* ♀. *Calyx corollaque* maris nisi corolla paulo longiore. *Staminodia* corollam paulo superantia. *Ovarium* 3 mm. altum, glabrum, stigmate sessili disciformi. *Fructus* ambitu oblongus, ad 2 cm. longus et 8 mm. diametro.

Doi Wao, in evergreen jungle, 690–750 m., *Kerr* 2435 (♂), 2433 (♀).

Adenia viridiflora, *Craib* [Passifloraceae-Modecceae]; *A. cardiophyllae*, Engler, similis, sed foliis inferne haud integris, filamentis basi tantum connatis recedit.

Caules scandentes, cirrhosi, cortice stramineo vel cinereo longitudinaliter striato obtecti, glabri. *Folia* plus minusve ovata, apice obtusa, basi parum cordata, 4–9 cm. longa, 3·3–6 cm. lata, chartacea, pagina utraque glabra, nervis lateralibus utrinque 3–4 supra conspicuis subtus prominulis, nervulis uti reticulatione gracili subtus conspicuis, margine inferne grosse irregulariter crenato-serrato superne integro, petiolo 1–2·6 cm. longo apice glandula conspicua instructo suffulta. *Cymae* ♂ axillares, 2–3 cm. (pedunculo excluso) longae, glabrae, pedunculo communi 1·5–1·7 cm. longo suffultae; pedicelli graciles, circiter 9 mm. longi; bracteae parvae; flores pallide virides (ex *Kerr*). *Calycis* tubus 7 mm. longus, glaber; lobi 3·25 mm. longi, apice reflexi. *Petala* 6 mm. longa, 2·55 mm. lata, glabra. *Stamina* 5, filamentis inferne complanatis basi connatis ovariumque parvum rudimentarium laxe cingentibus; antherae 2·5 mm. longae, filamentis paulo longiores.

Mê Chang, in bamboo jungle, 330 m., *Kerr* 2340.

Lao name, Puk sap (ex *Kerr*).

Adenia pinnatisecta, *Craib*, comb. nov.—*Modecca pinnatisecta*, Craib in Kew Bull. 1911, p. 56, et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 92.

Chiengmai, Doi Sutep, 720 m., *Kerr* 751.

Distr. Burma.

Eugenia Zimmermannii, *Warburg ex Craib* [Myrtaceae-Myrteae]; ab *E. densiflora*, Duthie, cui affinis, ramulis cinereo-corticatis, foliorum nervis inferioribus obliquis, inflorescentia laxiore recedit.

Arbor partibus omnibus glabra; ramuli primo quadrangulares, demum fere teretes, cortice pallide cinereo irregulariter longitudinaliter reticulato-striato obtecti. *Folia* plerumque oblanceolata vel oblongo-oblanceolata, apice inconspicue breviter acuminata, obtusa, basi late cuneata, cuneata vel attenuato-cuneata, ad 15 cm. longa et 4·5 cm. lata, coriaceo-papyracea, pellucido-punctata, nervis lateralibus utrinque 7–10 intra marginem anastomosantibus inferioribus satis obliquis omnibus cum costa supra subprominulis subtus prominentibus, nervulis oculo armato supra conspicuis subtus uti reticulatione gracili subprominulis, petiolo supra canaliculato latiusculo vel fere subalato ad 1·7 cm. longo suffulta. *Receptaculum* vix 5 mm. altum, apice 6 mm. diametro, basin versus attenuatum, glabrum. *Sepala* 3·5 mm. longa et 4·5 mm. lata. *Petala* alba (ex *Kerr*), 8·5 mm. longa, 7 mm. lata. *Filamenta* ad 1·1 cm. longa, glabra, antheris parvis. *Stylus* staminibus subaequilongus.

Bangkok, *Zimmermann* 160; Chiengmai, 300 m. (cultivated ?), *Kerr* 1855.

Hedyotis dimorpha, *Craib* [Rubiaceae-Hedyotideae]; ab affini *H. capitellata*, Wall., indumento facile distinguenda.

Caules volubiles, densius pubescentes vel tomentoso-pubescentes, demum fere glabri vel omnino glabri, cinereo-corticati. *Folia* lanceolata vel late lanceolata, apice acute acuminata, basi cuneata vel late cuneata, ad 8 cm. longa et 2·4 cm. lata, chartacea vel rigide chartacea, supra breviter parcius pubescentia, subtus pallidiora, molliter albo-pubescentia, nervis lateralibus utrinque 5 supra conspicuis vel leviter impressis subtus prominentibus, nervis transversis obscuris, margine revoluto, petiolo brevi suffulta; stipulae fimbriato-sectae, breves. *Inflorescentia* e capitulis in axillis foliorum superiorum solitariis et terminalibus vel ob folia superiora reducta racemosim dispositis ad 2·5 cm. diametro constituta. *Flores* dimorphi, 4–5-meri. *Receptaculum* 1·5 mm. altum, breviter parce pubescens. *Calycis* segmenta deltoidea, acuta, 1·5 mm. longa, dorso pilis albidis rectis parce instructa. *Corollae* tubus 1·5 mm. longus; lobi 5 mm. longi, basi fere 1·5 mm., apice 0·75 mm. lati, intra inferne pilis albidis rigidiusculis barbati, extra superne pilis paucis rigidis instructi. *Filamenta* in forma longistyla circiter 1 mm. longa, in forma brevistyla 5·5 mm. longa, antheris circiter 1·5 mm. longis. *Stylus* in forma longistyla 5·5 mm. longus, ramis 1·5 mm. longis, ima basi summoque apice glaber, medio pilis albidis rigidis adscendentibus instructus, in forma brevistyla 4 mm. (ramis inclusis) longus.

Pak Kawng, near Lakon, in scrub jungle, 360 m., *Kerr* 2310; Mê Ka Mi, trailing over low herbage in marshy ground, 360 m., *Kerr* 2379.

Distr. Upper Burma; Shan Hills Terai, 900 m., *Collett* 430.

Lao name, Kûa kao kûn? (ex *Kerr*).

(317) **Mycetia glandulosa,** *Craib* [Rubiaceae-Mussaendeae]; a *M. longifolia*, K. Sch., calyce glanduloso distinguenda.

Fruticulus vix unimetralis (ex *Kerr*); ramuli primo breviter pubescentes, demum glabri, cortice stramineo nitido obtecti. *Folia* oblanceolata vel oblongo-oblanceolata, apice acuminata, acuta, basi cuneato-attenuata, saepe parum inaequilatera, 11·5–20 cm. longa, 2·8–5·5 cm. lata, chartacea, pagina utraque pilis rigidiusculis pallidis sparse instructa, nervis lateralibus utrinque circiter 30 plerumque arcuatis supra conspicuis subtus prominentibus, petiolo 4–8 mm. longo supra canaliculato ut ramulis pubescente suffulta; stipulae foliaceae, 6–8 mm. longae, circiter 5 mm. latae. *Inflorescentia* 5 cm. longa, 8 cm. diametro, ramis inferioribus 2 cm. longis, pedicellis circiter 5 mm. longis. *Receptaculum* vix 2 mm. altum, glabrum. *Calyx* glanduloso-fimbriatus, 1·5 mm. longus. *Corollae* luteae (ex *Kerr*) tubus 9·5 mm. longus, extra parce pubescens, intus villosus; lobi apice uncinati, circiter 1·5 mm. longi. *Stylus* 9·5 mm. (ramis inclusis) longus.—*Mycetia longifolia*, Craib in Kew Bull. 1911, p. 390 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 104, *non* K. Sch.

Chiengmai, Doi Sutep, in evergreen jungle, 660 m., *Kerr* 1148.

Mycetia gracilis, Craib [Rubiaceae-Mussaendeae]; a *M. cauliflora*, Reinw., cui affinis, foliis minoribus, floribus paucioribus, receptaculo glabro distinguenda.

Fruticulus circiter 1·5 m. altus (ex *Kerr*); ramuli primo puberuli, demum glabri, cortice pallido plerumque nitido obtecti. *Folia* oblanceolata vel late oblanceolata, apice acuminata, acuta, basi cuneata, 2·5–7·5 cm. longa, 0·8–1·8 cm. lata, chartacea vel membranaceo-chartacea, supra glabra, subtus costa nervisque puberula, nervis lateralibus utrinque circiter 10 supra conspicuis subtus prominulis, nervis transversis supra subconspicuis subtus subprominulis, petiolo brevi supra canaliculato suffulta; stipulae angustae, circiter 5 mm. longae. *Inflorescentia* e cymulis simplicibus 3-floribus constituta vel saepius ramulis duobus oppositis quoque bifloro inferne additis; pedunculus communis plerumque circiter 6 mm. longus; pedunculi laterales partiales 8–12 mm. longi; pedicelli graciles, 9 mm. longi; bracteae parvae. *Receptaculum* turbinatum, 2·5 mm. altum, apice 3 mm. diametro, glabrum. *Calycis* segmenta plus minusve linearia, acuta vel obtusiuscula, ad 2·5 mm. longa et 0·75 mm. lata. *Corollae* luteae (ex *Kerr*) tubus 1·4 cm. longus, intus pilosus, extra glaber; lobi ad 3 mm. longi et 1·5 mm. lati. *Filamenta* brevia, antheris 2 mm. longis. *Stylus* 1·1 cm. longus, parce pilosus, ramis 3 mm. longis. —*Mycetia cauliflora*, Craib in Kew Bull. 1911, p. 390 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 104, *vix* Reinw.

Chiengmai, Doi Sutep, in evergreen jungle by stream, 900 m., *Kerr* 1833.

Dist. Upper Burma: Southern Shan States, *Macgregor* 674 (Herb. Calcutta!)

Mycetia rivicola, *Craib* [Rubiaceae-Mussaendeae]; ab affini *M. cauliflora*, Reinw., ramulorum indumento magis persistente, stipulis majoribus, inflorescentiae rigidioris indumento densiore recedit.

Fruticulus ad 1·2 m. altus (ex *Kerr*); ramuli primo breviter adpresse pubescentes vel subtomentelli, mox puberuli, demum glabri, cortice pallido plus minusve lenticellato obtecti, ad 6 mm. diametro. *Folia* oblanceolata, late oblanceolata vel oblongo-oblanceolata, apice plerumque breviter acute acuminata, basi attenuato-cuneata, ad 22 cm. longa et 6 cm. lata, chartacea, supra glabra, subnitida, subtus pallidiora, costa nervisque breviter adpresse pubescentia, nervulis puberula, nervis lateralibus utrinque plerumque 15–20 supra conspicuis vel subprominulis subtus prominentibus, nervis transversis pagina superiore conspicuis inferiore prominulis; petioli 6–10 mm. longi, supra canaliculati, indumento ut ramuli; stipulae mox deciduae, ad 7 mm. longae et 3·5 mm. latae, pallidae. *Inflorescentia* terminalis, e cymis paniculatim dispositis composita, circiter 4 cm. longa et 5 cm. diametro; bracteae stipulis subsimiles nisi minores; pedunculus communis brevis; pedunculi partiales oppositi, inferiores circiter 1·5 cm. longi, rigidi; pedicelli circiter 7 mm. longi. *Receptaculum* 2 mm. altum, pilis brevibus adpressis tectum. *Calycis* segmenta lanceolata, acuta, 3 mm. longa, 1 mm. lata, dorso plus minusve distincte uninervata parceque adpresse pubescentia. *Corollae* luteae (ex *Kerr*) tubus circiter 1 cm. longus, extra glaber, intus pilosus; lobi ad 2 mm. longi et 1·25 mm. lati, dorso superne parcius adpresse pubescentes. *Filamenta*

brevissima, antheris 1·75 mm. longis. *Stylus* 5·5 mm. longus, superne parce pilosus, ramis 4 mm. longis.

Chiengmai, Doi Sutep, in thick evergreen jungle by stream, 1650 m., *Kerr* 1869.

Gardenia Collinsae, *Craib* [Rubiaceae-Gardenieae]; a *G. lucida,* Roxb., nervis lateralibus utrinque circiter 10 recedit.

Ramuli glabri, cortice pallido laevi obtecti. *Folia* plerumque elliptica vel obovata, apice breviter obtuse acuminata vel rotundata, basi cuneata vel rotundato-cuneata, 2·5–6 cm. longa, 1·6–4·2 cm. lata, rigide chartacea, pagina utraque glabra, subtus pallidiora, pauperrime distanter ciliata, nervis lateralibus utrinque circiter 10 pagina utraque conspicuis vel fere subprominulis, nervis transversis oculo armato utrinque conspicuis, petiolo brevi suffulta; stipulae connatae, ad 8 mm. longae. *Flores* solitarii, breviter pedicellati, sicco lutei. *Receptaculum* 3 mm. altum, 2·25 mm. diametro, glabrum. *Calycis* tubus circiter 1·5 mm. longus; segmenta 7, viridia, angusta, acutiuscula, ad 1·1 cm. longa, pauperrime ciliata. *Corollae* tubus 2 cm. longus; lobi 6, parum variabiles, apice rotundati, ad 2·4 cm. longi, 0·7–1·1 cm. lati. *Stylus* superne fusiformis, vix 2·4 cm. longus, glaber; ovarii placentae duae.

Sriracha, near beach, *Mrs. D. J. Collins* 110.

Ixora cibdela, *Craib* [Rubiaceae-Ixoreae]; *I. grandifoliae,* Zoll. et Mor., facie similis sed inflorescentia glabra articulata recedit.

Frutex vel *arbuscula* parce ramosa, ad 4·5 m. alta (ex *Kerr*), ramulis brunneo- vel cinereo-brunneo-corticatis. *Folia* variabilia, oblongo-oblanceolata, oblonga vel oblongo-lanceolata, rarius fere ovata, apice obtusa, rarissime breviter acute acuminata, basi plerumque cuneata, ad 20 cm. longa et 6·5 cm. lata, coriacea vel subcoriacea, pagina utraque glabra, nervis lateralibus utrinque 10–14 supra subconspicuis subtus prominentibus, petiolo supra canaliculato 0·5–1·3 cm. longo suffulta; stipulae ad 6 mm. longae, diutius persistentes. *Inflorescentia* brachiata, subsessilis, glabra, articulata; ramuli inferiores ad 4·5 cm. longi; cymularum pedunculi circiter 2 mm. longi; flos terminalis sessilis, flores laterales pedicello pedunculo subaequilongo suffulti; bracteae bracteolaeque parvae. *Receptaculum* 1 mm. altum. *Calycis* segmenta apice rotundata, 0·5 mm. longa, inter se parum inaequalia. *Corollae* puniceae (ex *Kerr*) tubus usque ad 1·3 cm. longus; lobi oblongi, parum retusi, 6·5 mm. longi, 3 mm. lati. *Filamenta* 3 mm. longa, antheris 5·75 mm. longis. *Stylus* ad 4·5 mm. exsertus.—*I. grandifolia,* Zoll. et Mor., var *glabra,* Craib in Kew Bull. 1911, p. 394; Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 108.

Chiengmai, in eng jungle on Doi Sutep, 330–660 m., *Kerr* 530, 1706; Chiengmai, 300 m., *Hosseus* 178; Doi Chieng Dao, 400 m., *Hosseus* 469; Prê, 156–240 m., *Luang Vanpruk* 130.

Lao name, Dauk kem (ex *Kerr*).

Ixora Collinsae, *Craib* [Rubiaceae-Ixoreae]; ab *I. parviflora,* Vahl, petiolis longioribus, foliis basi plerumque cuneatis, inflorescentia glabra facile distinguenda.

Ramuli glabri, primo parum compressi, mox teretes, ad 4 mm. diametro, brunneo- vel pallide brunneo-corticati. *Folia* elliptica vel ovato-elliptica, rarius late oblongo-oblanceolata vel obovato-oblanceolata, apice breviter obtusissime acuminata, basi saepius cuneata vel late cuneata, 6·5–18 cm. longa, 1·7–7·7 cm. lata, chartaceo-coriacea, nervis lateralibus utrinque 10–12 intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis pagina utraque conspicuis vel inferiore fere subprominulis, margine plerumque leviter recurvo, petiolo 0·5–1·7 cm. longo supra canaliculato suffulta; stipulae e basi 4 mm. lata subulato-acuminatae, 7 mm. longae. *Inflorescentia* terminalis, sessilis, glabra; cymae brachiatae, articulatae; ramuli laterales inferiores ad 5 cm. longi, superiores ab inferioribus ad 6·5 cm. distantes, ad 2 cm. longi; bracteae bracteolaeque parvae; cymularum pedunculi ad 3·5 mm. longi, floribus terminalibus sessilibus, lateralibus pedicello 1·5 mm. longo suffultis; flores pallide punicei (ex *Collins*). *Receptaculum* 0·75 mm. altum. *Sepala* 4, vix 0·75 mm. longa, 0·75 mm. lata. *Corollae* tubus 6·5 mm. longus, lobi 4, oblongi, emarginulati, 3·5 mm. longi, 2·25 mm. lati. *Filamenta* 1·5 mm. longa, antheris 3·5 mm. longis. *Stylus* circiter 1 cm. longus, bifidus. *Fructus* brunneus, subglobosus, circiter 5 mm. diametro.

Sriracha, 4·5 m., *Mrs. D. J. Collins* 60.

Ixora Kerrii, *Craib* [Rubiaceae-Ixoreae]; ab *I. stricta*, Roxb., corollae tubo breviore eiusque lobis arcte reflexis distinguenda.

Frutex 1·5–2·4 metralis (ex *Kerr*), omnino glaber; ramuli primo parum compressi, mox teretes, ad 5·5 mm. diametro, cortice pallide brunneo reticulato-striato obtecti. *Folia* oblonga ad oblongo-ovata, apice breviter acuminata, obtusa, basi cuneata, obtusa vel rotundata, interdum leviter cordata, ad 21 cm. longa et 7 cm. lata, mox coriaceo-chartacea, nervis lateralibus utrinque circiter 11–14, supremis bene intra marginem anastomosantibus, pagina superiore conspicuis vel fere subprominulis inferiore prominentibus, nervis transversis uti reticulatione laxa pagina utraque oculo armato conspicuis, petiolo validiusculo 3–5 mm. longo suffulta; stipulae basi latiusculae, apice longe subulato-acuminatae, ad 1 cm. longae. *Inflorescentia* densa, ad 20 cm. diametro, sessilis vel pedunculo communi usque ad 5 cm. longo suffulta, articulata, glabra; ramuli inferiores 2·8–6 cm. longi; cymularum pedunculi breves, floribus sessilibus; bracteae bracteolaeque parvae. *Receptaculum* circiter 1 mm. altum. *Calyx* vix 0·5 mm. longus. *Corollae* puniceae (ex *Kerr*) tubus gracilis, 1–1·3 cm. longus; lobi reflexi, oblongi, apice rotundati vel parum retusi, circiter 2·5 mm. longi et 1·5 mm. lati. *Antherae* apice acuminatae, paululo ultra 3 mm. longae. *Stylus* gracilis, ad 1·6 cm. longus, glaber. *Fructus* purpureus (ex *Kerr*), plus minusve late ellipsoideus, 1 cm. altus, seminibus brunneo-stramineis. *Ixora* sp. near *I. stricta*, Roxb., Craib, Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 109.

Chiengmai, Doi Sutep, in evergreen jungle, 1350–1650 m., *Kerr* **1745, 1745A.**

Leptodermis trifida, *Craib* [Rubiaceae-Paederieae]; a *L. lanceolata*, Bunge, foliorum nervis lateralibus paucioribus, stylo trifido recedit.

Frutex circiter 1·5 m. altus (ex *Kerr*); ramuli primo tenuiter bifacialiter pubescentes, mox glabri, cortice brunneo-stramineo parce lenticellato obtecti. *Folia* opposita et in axillis fasciculiformia (ramulis brevissimis axillaribus gesta), plerumque oblanceolata vel late oblanceolata, apice acuta, mucronata, basi cuneata, ad 2·2 cm. longa et 8·5 mm. lata, rigida, glabra, nervis lateralibus utrinque 4 pagina inferiore prominentibus, nervulis ob colorem caeruleum pagina inferiore conspicuis, margine recurvo, petiolo 2–3 mm. longo suffulta; stipulae late deltoideae, acutae vel acuminatae, ad 3 mm. longae, saepe divaricatae, dorso breviter pubescentes. *Bracteae* solitariae, late ovatae, cuspidato-acuminatae, acutae, 5 mm. longae, 3·5 mm. latae, uninervatae, dorso breviter pubescentes, ciliolatae; bracteolae omnino connatae, ad 4 mm. longae. *Receptaculum* 1·5 mm. altum, atrum, glabrum. *Sepala* 5, inter se subaequalia, 1 mm. longa, ciliata. *Corollae* lilacinae (ex *Kerr*) tubus 1·2 cm. longus, intus pilosus, extra puberulus; lobi ad 3·5 mm. longi. *Antherae* 2 mm. longae. *Stylus* 1·4 mm. longus, superne puberulus, trifidus.

Doi Chieng Dao, top of peak, 1770 m., *Kerr* 2873.

Craibiodendron stellatum, *W. W. Smith*, comb. nov. *C. shanicum*, W. W. Smith in Rec. Bot. Surv. Ind., vol. iv. p. 277; Craib in Kew Bull. 1911 p. 405; W. W. Smith in Notes Roy. Bot. Gard. Edin., vol. v. p. 157, pl. cviii.; Craib, Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57 p. 121. *Schima? stellata*, Pierre ex Lanessan Pl. util. Colon. Franç., p. 295; Pierre, Fl. Forest. Cochinch. pl. 122; Pitard in Lec. Fl. Indo-Chine, vol. i. p. 352.

Chiengmai, Doi Sutep, 360–840 m., *Kerr* 1282, 1282A, 1369.

Distr. Burma, S. China, Cambodia (Laos, ex *Fl. Indo-Chine*).

Christisonia siamensis, *Craib* [Orobanchaceae]; *C. Scortechinii*, Prain, facie persimilis sed squamis haud linearibus, corolla purpurea differt.

Herba subacaulis, ad 7–flora, glabra. *Squamae* ovatae vel oblongo-ovatae, 0·7–2·5 cm. longae. *Pedicelli* validi, usque ad 3 cm. longi. *Calyx* tubulosus, tubo 1·3–1·8 cm. longo et 1 cm. diametro; lobi interdum 2 tantum, interdum 4 vel 5, deltoidei vel late deltoidei, acuti, 0·5–1 cm. longi. *Corolla* circiter 6 cm. longa, tubo purpureo-suffuso, lobis pupureis (ex *Kerr*); tubi pars basalis 2·5 cm. longa, 4 mm. diametro, pars superior 1·3 cm. diametro; lobi manci. *Stamina* didynama, glabra, filamentis longioribus 1·4 cm. brevioribus vix 1 cm. longis, antherarum loculis 3·5 mm. longis; staminum inferiorum antherae appendice oblongo obtuso 7 mm. longo 2·5 mm. lato instructae. *Ovarium* glabrum, 6 mm. altum, 6 mm. diametro, stylo glabro 3·8 cm. longo, stigmate peltato 4 mm. diametro papillis minutis tecto.

Mê Nan, Sop Ngao, in bamboo jungle, 210 m., *Kerr* 2406.

Chirita Kerrii, *Craib* [Gesneraceae-Cyrtandreae]; habitu speciminibus minoribus *C. hamosae*, Don, similis sed bracteis connatis ad *C. rupestrem*, Ridl. eiusque affiniores proxime accedit.

Herba caule simplice 4–7 cm. alto apicem versus laxe piloso inferne glabrescente brunneo unifoliato vel haud rarius producto foliaque duo opposita semper folio inferiore conspicue minora gerente. *Folia* ovata vel late ovata, apice obtusa, basi plerumque cordata, 4–11·5 cm. longa, 2·8–7·3 cm. lata, membranacea, pagina utraque pilis albis hic illic instructa, inferiore pallidiora, ciliata, nervis lateralibus utrinque 8–10 infra conspicuis, petiolo 0·3–1·5 cm. longo supra praecipue piloso suffulta. *Cymae* pedunculo communi 5 mm. longo piloso suffultae, bracteis duabus inferne connatis late ovatis vel ovato-orbicularibus acutis vel brevissime acute acuminatis ad 1·2 cm. longis et 1·1 cm. latis ciliatis pauci-serratis ornatae; pedicelli 6 mm. longi, parce pilosi. *Calycis* segmenta lineari-lanceolata vel lanceolata, apice attenuata vel fere acuminata, acuta, 6·5 mm. longa, 1·5 mm. lata, ciliata, dorso parce pilosa. *Corollae* ventricosae tubus 1·2 cm. longus, lobi 5, apice rotundati, ad 4 mm. longi et 4·5 mm. lati. *Stamina* duo, inclusa, glabra. *Ovarium* 7 mm. altum, glabrum vel subglabrum, stylo circiter 6 mm. longo apice bifido parce pubescente; discus parvus.

Mê Ping Rapids, Fa Man, in crevices of damp rock, 180 m., *Kerr* 2194.

Ornithoboea lanata, *Craib* [Gesneraceae-Cyrtandreae]; a speciebus omnibus adhuc descriptis caule petiolis pedunculisque cinnamomeo-lanatis facile distinguenda.

Caulis simplex, 20–30 cm. altus, ad 5 mm. diametro, cinnamomeo-lanatus. *Folia* opposita, inaequilatera, ovata vel elliptico-ovata, basi inaequalia, latere altero rotundato cordato, altero latissime cuneato vel fere truncato parum cordato, ad 22 cm. longa et 11·7 cm. lata, membranacea, pagina superiore pilis brevibus sparse instructa, inferiore costa nervisque cinnamomeo-lanata, nervis lateralibus utrinque circiter 11 supra conspicuis subtus prominentibus, nervis transversis laxis oculo armato pagina utraque conspicuis, petiolo ad 6 cm. longo ut caule lanato suffulta. *Inflorescentia* axillaris, ut caulis dense cinnamomeo-lanata; pedunculus communis infructescens ad 2 cm. longus; pedicelli ad 1·5 cm. longi. *Calycis* infructescentis segmenta arcte reflexa, ad 9 mm. longa, circiter 2 mm. lata. *Capsula* circiter 1·8 cm. longa, valvis tortis; semina fusiformia, vix 0·4 mm. longa, nigra.

Doi Chieng Dao, on limestone rocks, 660 m., *Kerr* 2852.

Lao name, Ya kon sûa (ex *Kerr*).

Strobilanthes leucocephalus, *Craib* [Acanthaceae-Ruellieae]; a *S. Brandisii,* T. And., corolla breviore distinguendus.

Caules primo pilis longiusculis tecti, mox glabri, pallide brunneo-corticati. *Folia* ovato-elliptica vel oblongo-elliptica, apice plerumque acuminata, obtusa vel acutiuscula, basi acuminata ad late cuneata, ad 11·5 cm. longa et 5·3 cm. lata, chartacea, pagina superiore pilis longiusculis hic illic instructa, inferiore costa nervis nervulisque pilis longis parcius instructa, supra arctius breviter lineolata, nervis lateralibus utrinque ad 9 supra conspicuis subtus cum costa prominentibus, nervis transversis subtus prominulis, margine acumine excepto serrato-crenata, ciliata, petiolo ad 1 cm. longo suffulta. *Flores* violacei

(ex *Kerr*), in capitula circiter 1·5 cm. diametro sessilia vel breviter pedunculata conspicue albo-pilosa aggregati; bracteae e basi elliptica lineari-lanceolatae, obtusiusculae, 1·9 cm. longae, 6 mm. latae, inferne utrinque pilis albis longis dense barbatae, superne pilis brevioribus glanduloso-capitatis ornatae; bracteolae binae, 1·2 cm. longae et 2·5 mm. latae, indumento bractearum. *Calyx* ad 1 cm. longus, segmentis inter se parum inaequalibus dense longe albo-ciliatis. *Corolla* circiter 3 cm. longa (omnibus plus minusve mancis). *Ovarium* apice pilis longis albis densis ornatum.

Doi Din Deng, common in evergreen jungle by streams, 540–630 m., *Kerr* 2317.

Lao name, Kwi nu din? (ex *Kerr*).

Strobilanthes niveus, *Craib* [Acanthaceae-Ruellieae]; a *S. petiolari*, Nees, foliis crenulatis vel serrato-crenulatis haud serratis recedit.

Caules decumbentes, nodis inferioribus radicantes, ad 35 cm. alti, saepissime simplices, graciles, pilis albidis brevibus tecti. *Folia* opposita inaequalia, ovato-lanceolata, ovata, ovato-elliptica vel elliptica, apice breviter saepe inconspicue obtuse acuminata, basi cuneata, saepius decurrentia, 3–9·5 cm. longa, 1·5–4·3 cm. lata, chartacea, subtus pallidiora, subglabra, nervis lateralibus utrinque 6–7 supra conspicuis subtus prominulis, nervis transversis subtus conspicuis, crenulata vel serrato-crenulata; petioli foliorum oppositorum plerumque inter se parum inaequilongi, ad 1·7 cm. longi, indumento ut caules. *Spicae* usque ad 8 cm. longae; bracteae ligulato-spatulatae, apice breviter recurvae, 7·25 mm. longae, 2·25 mm. latae, extra longe parce albo-pilosae, intus brevius pilosae, ciliatae; bracteolae binae, lineares, 4·25 mm. longae, 0·75 mm. latae, dorso pilosae, ciliatae. *Calyx* 9·5 mm. longus, segmentis inter se parum inaequalibus ciliatis dorso pilis brevibus albis sparse instructis praetereaque superne pilis longis albis ornatis. *Corolla* nivea (ex *Kerr*), saltem 2·3 cm. longa, parte tubi basi aequali circiter 1 cm. longa. *Filamenta* pubescentia. *Stylus* basi glaber, superne pilis albis brevibus adscendentibus sparse instructus.

Doi Wao, in evergreen jungle, 900 m., *Kerr* 2442.

Strobilanthes venustus, *Craib* [Acanthaceae-Ruellieae]; a *S. auriculato*, Nees, eiusque varietatibus inflorescentia laxiore bracteis majoribus recedit.

Fruticulus vix metralis (ex *Kerr*); ramuli primo flexuosi, quadrangulares, angulis primo acutis mox rotundatis, pilis divaricatis rigidis magis minusve instructi, cinereo-brunneo-corticati. *Folia* late oblanceolata vel oblongo-oblanceolata, apice acute acuminata, basi auriculata, auriculis ramulos amplectentibus, 7·5–20 cm. longa, 2–6 cm. lata, paribus oppositis inaequalibus, chartacea, supra costa dense ceterum parce pilosa, subtus costa nervis nervulisque parce pilosa, nervis lateralibus utrinque 12–14 supra conspicuis subtus prominentibus, nervis transversis supra vix conspicuis subtus prominulis, ciliata, serrulata vel denticulata, sessilia. *Spicae* circiter 4 cm. longae; bracteae spatulato-rotundatae, acuminatae, acumine reflexo, ad 1 cm. longae et fere

1 cm. latae, pagina utraque pilis albidis glanduloso-capitatis praetereaque dorso medio margineque pilis longis albis instructae. *Calycis* tubus 2 mm. longus; lobi inter se parum inaequales, ad 7 mm. longi, dorso pilis albis paucis breviusculis glanduloso-capitatis paucis longioribus instructi. *Corolla* violacea (ex *Kerr*), 3·5 cm. longa; tubi pars basi aequalis paulo ultra 1 cm. longa; lobi usque ad 5 mm. longi et 7 mm. lati. *Filamenta* longiora 6 mm. longa, breviora 1·5 mm. longa. *Stylus* glaber.

Chiengmai, cultivated in Forestry compound, supposed to have been brought from the jungle, *Kerr* 2296.

Plectranthus Garrettii, *Craib* [Labiatae-Ocimoideae]; a *P. calcarata*, Hemsl., cui valde affinis, foliorum indumento distinguendus.

Caules primo densiuscule crispatim piloso-pubescentes, pilis mox plus minusve deciduis, nodis inferioribus saepe radicantes, internodiis usque ad 7 cm. longis. *Folia* ovato-lanceolata vel lanceolata, rarius obovata, apice brevissime acuminata, acuta vel cum obovata rotundata, basi cuneata, latissime cuneata vel rotundato-cuneata, 1·3–3·8 cm. longa, 0·7–2·6 cm. lata, membranaceo-chartacea vel chartacea, pagina utraque sed superiore densius pilis validiusculis instructa, crenato-serrata, petiolo usque ad 1·5 cm. longo indumento ut caule instructo suffulta. *Flores* in verticillastris racemosim dispositis; bracteae 3·5 mm. longae; pedicelli ad 5 mm. longi. *Calyx* bilabiatus, lobis omnibus pilis glanduloso-capitatis ciliatis; labium superum apice rotundatum, sub anthesin 2 mm. longum, 2 mm. latum, in fructu paulo majus, inferum 2 mm. longum, 1·5 mm. latum, post anthesin accrescens; lobi laterales breves, rotundati. *Corolla* 2·1–2·3 cm. (calcare 7–9·5 mm. longo incluso) longa; labium superum breviter 4-lobatum, lobis lateralibus medianos paulo superantibus, inferum oblongum, apice rotundatum, fere 4 mm. longum, 2 mm. latum. *Filamenta* longiora 1·05 cm. longa, breviora 4 mm. longa, omnia glabra. *Stylus* 1·3 cm. longus, glaber, apice breviter bifidus. *Nuculae* 1·25 mm. altae, paulo ultra 0·75 mm. diametro, fuscae, glabrae, minutissime punctatae.

Doi Intanon, Pah Ngeam, 1142 m., *Garrett* 65.

XX.—DIAGNOSES AFRICANAE: LVIII.

1491. **Anacampseros rhodesica,** *N. E. Brown* [Portulacaceae]; affinis *A. ustulatae*, E. Mey. sed humilior, ramis simplicibus, stipulis cuspidatis squarrosis argenteis differt.

Herba perennis, dense caespitosa, 1–3 cm. alta, argentea, omnino glabra. *Rami* erecti, simplices, 4–10 mm. longi, 3 mm. diametro, cylindrici, obtusi vel acuti, stipulis argenteis densissime obtecti. *Folia* sessilia, stipulis occulta, 1 mm. longa, 1·5–2 mm. lata, transverse elliptica vel reniformia, integra, carnosa. *Stipulae* dense imbricatae, 2·5 mm. longae, 2 mm. latae, ovato-orbiculares, breviter cuspidatae, squarrosae, submembranaceae, argenteae. *Flores* terminales, solitarii, sessiles, bracteis amplectantibus occulti. *Bracteae* 4–7 mm. longae, ovato-lanceolatae,

acutae, erectae, imbricatae, argenteae. *Sepala* 3 mm. longa, 2 mm. lata, ovata vel elliptico-ovata, subacuta vel obtusa, membranacea vel petaloidea, albida vel carneo-albida. *Petala* 5, alba vel carneo-alba, 2·5 mm. longa, 1·5–1·75 mm. lata, elliptica vel elliptico-oblonga, obtusa. *Stamina* 6; filamenta basi brevissime connata, glabra; antherae 1·5 mm. longae, dorsifixae, luteae. *Ovarium* globosum, glabrum; stylus 1·25 mm. longus; stigma simplex. *Capsula* 4 mm. longa, oblonga, 4-valvis.

Tropical Africa. Rhodesia: Matopo, *J. G. McDonald, W. E. Dowsett;* Salisbury, *H. G. Mundy.*

This curious little plant presents the appearance of a tuft of short silvery cylindric stems arising from a fleshy tuberous root, without evidence of leaves or expanded flowers. The leaves are minute, and concealed under the small silvery scales which clothe the stem, and the flowers are concealed by the bracts which wrap round them in bud-like form at the tips of the branches. It was first sent to Kew by Mr. J. G. McDonald, as being used by the natives as a remedy for blackwater fever. The natives are said to brew it and throw away the first brew, using the second brew for severe cases, and the third for mild ones. Subsequently it was received from Mr. H. Godfrey Mundy, of Salisbury, Rhodesia, under the native name of "Qilika," as being used extensively in the manufacture of intoxicating liquors, but its use will probably be prohibited by law, as it is found to be deleterious. Dr. R. Marloth, in his *Flora of South Africa*, vol. i., records that *A. ustulata*, E. Mey., is also used by the natives in the making of a kind of beer, and for preparing a yeast. I have also been informed that *A. papyracea*, E. Mey., is used to make an intoxicating drink. As these three species are allied to one another, and all have the same general habit, they probably have similar medicinal properties. If the flowers of these species ever expand they must remain open for a very short time. All the parts are fully developed, but I have never seen an expanded flower of *A. ustulata* or *A. papyracea*, although I have seen and had them under cultivation for some years. Freshly gathered specimens of *A. rhodesica* in full flower have been sent in fluid to Kew by Mr. W. E. Dowsett, but all the flowers were unopened, although sepals, petals, stamens and ovary were fully developed. Ripe seeds are, however, freely produced.

1492. **Helichrysum eriophorum,** *Conrath* [Compositae-Inuloideae]; affine *H. lanato,* Harv., a quo foliis angustioribus capitulisque minoribus differt.

Caulis erectus, simplex, 30–35 cm. altus, ut folia appresse griseo-lanatus, usque ad inflorescentiam foliatus. *Folia* sessilia, oblongo-lanceolata, in basin sensim angustata, apice acuto recurvato saepe glabrescente; folia intermedia ceteris longiora et latiora, usque ad 8 cm. longa, ad 1·4 cm. lata, 5–nervia, inferiora breviora, superiora angustiora. *Inflorescentia* circiter 2·5 cm. diametro. *Capitula* in corymbum densissimum globosum congesta, sessilia, oblongo-ovoidea, 3·5–4 mm. longa, 1·5 mm. crassa, 10–12–flora. *Involucri bracteae* pluriseriatae, citrinae, oblongo-lanceolatae, longe acute acuminatae, basi lanatae. *Achaenia* glabra. *Pappi* setae pilis longis appressis.

South Africa. Transvaal: rocks near Irene, *Conrath* 432.

1493. **Senecio urophyllus,** *Conrath* [Compositae-Senecionideae]; affinis *S. bupleuroidi,* DC., a quo foliis non auriculatis differt.

Herba rigide erecta, 9–10 dm. alta. *Caulis* basi collo lanato, ramosus, valde sulcatus, glaber. *Folia* sessilia, firma, versus basin caulis congesta, superna distantia, inferiora oblongo-lanceolata, sensim acuminata, basi semi-amplexicaulia, usque ad 17 cm. longa, 1·5 cm. lata, margine subreflexo, integra vel inconspicue remote denticulata, subtus nervo medio prominente lateralibus prominulis; folia intermedia basalibus similia sed basi breviter decurrente; folia superiora oblongo-elliptica, in acumen longum angustum abrupte contracta, basi rotundata vel subdecurrentia. *Inflorescentia* corymbosa, ramis elongatis iterum ramosis; bracteae parvae, acuminatae; pedunculi proprii capitulorum 0·5–4 cm. longi. *Capitula* mediocria, 5–7 mm. diametro, radiata, multiflora. *Involucri bracteae* biseriatae, exteriores paucae lineares interioribus multo breviores, interiores 12–14, oblongo-cuneatae, 4–5 mm. longae, glabrae, apice brevi cuspidato recurvo. *Flores* disci involucrum superantes, ei radii involucro altero tanto longiores. *Corolla* florum radii limbo late ligulari 5 mm. longo 2 mm. lato. *Achaenia* glabra.

South Africa. Transvaal: Modderfontein, *Conrath* 1202.

1494. **Wahlenbergia multiflora,** *Conrath* [Campanulaceae-Campanuleae]; affinis *W. ramulosae,* E. Mey., a quo habitu elatiore, ramis sparsius indutis minus divergentibus, floribus majoribus recedit.

Planta annua, e basi ipsa ramosissima. 3–5 dm. alta. *Rami* supra trientem inferiorem valde ramosi, plerumque undulati, graciliusculi, teretes, sparse pubescentes vel subglabri, multifoliati. *Folia* alterna, sessilia, suberecta, linearia, obtusiuscula, 3–7 mm. longa, 0·5–1 mm. lata, sparse denticulata vel integra, margine leviter incrassato, inferiora internodia aequantia, superiora breviora. *Pedicelli* 5–7 mm. rarius ad 9 mm. longi, graciles. *Receptaculum* fere hemisphaericum, glabrum, vix 1 mm. longum, cum calycis segmentis 3–4 mm. metiens. *Calycis segmenta* e basi triangulari lineari-subulata, obtusiuscula, marginibus saepius inconspicue remote denticulata, glabra. *Corolla* anguste infundibuliformis, 6–7 mm. longa, quinqueloba; tubus 4–5 mm. longus; lobi triangulares, acuti, 2 mm. longi. *Stylus* inferne sparse pilosus, infra stigmata 3 eglandulosus. *Capsula* breviter ovoidea, circiter 1·2 mm. longa, valvis tribus dehiscens.

South Africa. Transvaal: Modderfontein, in Eucalyptus plantations, *Conrath* 563.

1495. **Harveya crispula,** *Conrath* [Scrophulariaceae-Gerardieae]; affinis *H. Bodkini,* Hiern, a qua corollae tubo breviore ampliore recedit.

Planta herbacea, sordide obscure purpurea. *Caulis* 1–2 cm. longus, herbaceus, squamosus, glaber, foliis praeter squamas carens, 1–2-flora. *Squamae* appressae, obovatae, basi cuneatae,

2–2·5 mm. longae et latae. *Flores* singuli vel bini, subsessiles, magni. *Bracteae* obovatae vel obovato-oblongae, 12–13 mm. longae, 5–6 mm. latae, obtusiusculae, extra sparse (marginibus superioribus dense) crispule breviter pilosae, calycis dimidium aequantes vel minores; bracteolae 2, liberae, calycis basi insertae, erectae, oblongo-lineares, bracteis longiores, 15–16 mm. longae, 1·5 mm. latae, extra densiuscule crispule pubescentes. *Calyx* late tubuloso-infundibuliformis, 2·5–2·8 cm. longus, extra pilis longis septatis laxe appressis in lobis pilis crispulis densius indutus, superne bilabiatus; lobi 5–8 mm. longi, 3 superiores inter se similes, triangulari-oblongi, acuti, 2 inferiores longiores et latiores sinu profundiore. *Corolla* late tubulosa, superne quinquelobata, 4–4·5 cm. longa; tubus in basin sensim angustatus, inferne satis rectus, dorso gibbosus, sparse breviter pilosus, dorso et superne pilis longioribus crispulis septatis indutus, intus asperulus; limbus patulus, inconspicue bilabiatus, basi crispule pilosus, marginibus saepius crispule pilosus ceterum intus glabriusculus; lobi inter se subsimiles, late ovato-orbiculares, 11–13 mm. diametro, margine inconspicue remote undulato. *Filamenta* pilis brevibus rigidis crassis basi valde superne sparse induta, breviora 1·2 cm. longa, longiora 1·6 cm. longa; antherae biloculares, glabrae, 2–3 mm. longae, loculo longiore recto rostro longiore pallidiore, loculo breviore latiore semicirculari breviter apiculato. *Stylus* staminibus aliquanto longior, corollae tubo brevior, 1·7–1·8 cm. longus; stigma rotundatum, fere 2 mm. latum.

South Africa. Transvaal: Irene, *Conrath* 966.

1496. **Gladiolus atrorubens,** *N. E. Brown* [Iridaceae-Ixieae]; affinis *G. atropurpureo*, Baker, sed foliis multoties longioribus, floribus minoribus lobis minus inaequalibus facile distinguitur.

Caulis 50–65 cm. altus, gracilis, leviter compressus, glaber. *Folia* circa 5, erecta, inferiora 22–40 cm. longa, 3–5 mm. lata, superiora gradatim minora, linearia, acuminata, glabra. *Spica* 4–7 cm. longa, 4–9-flora. *Bracteae* 8–10 mm. longae, oblongo-ovatae, acutae vel obtusae, scariosae, pallide brunneae. *Corolla* 2·5 cm. longa, 1·5 cm. diametro, leviter oblique infundibuliformis, leviter curvata, atrorubra (siccata nigrescens); tubus 1·5 cm. longus; lobi subaequales, 1 cm. longi, 6 mm. lati, elliptici, obtusi.

South Africa. Transkei: near Manubi, *W. F. Saxton*. Mr. Saxton states that the flowers of this species are dark red, but when dried they are almost black.

1497. **Anthericum erythrorrhizum,** *Conrath* [Liliaceae-Asphodeleae]; affinis *A. hirsuto*, Thunb., a quo capsula molliter setosa recedit.

Radicis fibrillae miniatae. *Caulis* rigide erectus, 5–7 dm. altus, simplex vel superne ramis nonnullis longis, teres, breviter patenter sparse puberulus. *Folia* plura, basi caulis conferta, late linearia, usque ad 30 cm. longa, 3–9 mm. lata, apice rotundata, utrinque praecipue subtus sparse breviter pilosa, marginibus brevius densius indutis, utrinque nervis multis longitudinalibus exsiccando elevatis. *Bracteae* scariosae costa valida fusca excepta, triangulari-lanceolatae, acutae, dimidium pedicelli aequantes,

circiter 3 mm. longae, plerumque ciliatae; pedicelli ascendentes, rigidi, perianthio aequilongi vel breviores, 4–6 mm. longi, sub fructu ad 11 mm. longi. *Perianthium* 7–8 mm. longum; tepala oblonga, alba, costa valida brunnea. *Filamenta* teretia dentibus retrorsis dense asperata, quam antherae altero tanto longiora. *Stylus* teres, laevis, antheras paullo superans, perianthio brevior. *Capsula* obovato-orbicularis, 4 mm. diametro, setis crassiusculis mollibus acuminatis dense obtecta.

South Africa. Transvaal: Modderfontein, by a stream, *Conrath* 777.

1498. **Rynchospora angolensis,** *Turrill* [Cyperaceae-Rynchosporeae]; *R. glaucae*, Vahl, affinis sed foliis setaceis, inflorescentia laxiore, inflorescentiis partialibus majoribus, nucibus majoribus differt.

Planta caespitosa, culmis numerosis erectis usque ad 4·5 dm. altis glabris. *Folia* setacea, apice acuta, usque ad 14 cm. longa et 0·5 mm. diametro, glabra; vaginae integrae, glabrae. *Inflorescentia* laxe paniculata, inflorescentiis partialibus 2–9; bracteae setaceae, 3 mm. longae, basi vaginatae; inflorescentia partialis 9 mm. longa, 2·5 mm. diametro, glabra, brunnea, e floribus circiter 4 constituta. *Glumae* inferiores steriles, elliptico- vel oblongo-lanceolatae, apice acutae, 4–5 mm. longae, 1–1·5 mm. latae, superiores fertiles, ovato-lanceolatae, apice acutae vel leviter acuminatae, 6·5 mm. longae, 3·5 mm. latae. *Stamina* 3, antheris linearibus 4 mm. longis. *Setae* 6 (vel 7), 6 mm. longae, breviter plumosae. *Ovarium* 1·25 mm. altum, 0·4 mm. diametro; stylus (parte inferiore 1·5 mm. longa inclusa) 6 mm. longus, glaber, integer. *Nux* biconvexe elliptico-oblonga, 3 mm. alta, 1·75 mm. diametro, transverse rugosa, glabra, styli basi dilatata persistente 2 mm. longa coronata.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 3268.

1499. **Scleria angolensis,** *Turrill* [Cyperaceae-Sclerieae]; affinis *S. Hildebrandtii*, Boeck., sed nucibus majoribus facile distinguenda.

Rhizoma horizontale, squamis brunneis valde nervosis haud fibrosis obtectum. *Culmi* erecti, numerosi, triangulares, 1·5 mm. diametro, leviter pubescentes vel glabri, parte inferiore foliorum vaginis integris leviter pubescentibus obtecti. *Folia* linearia, apice acuta, usque ad 2·5 dm. longa et 3·5 mm. lata, pagina superiore aspera, costa impressa, nervis lateralibus inconspicuis. *Inflorescentia* foliis brevior, circiter 5 cm. longa et 1 cm. diametro, inflorescentiis partialibus circiter 8; bracteae lanceolato-lineares, basi vaginantes, apice longe acuminatae. *Inflorescentia partialis* mascula (spicula) circiter 10-flora, basi glumis vacuis 4; florum fertilium glumae oblongo-lanceolatae, apice acutae, 6 mm. longae, 2·5 mm. latae. *Stamina* 3, filamentis 7 mm. longis. *Inflorescentia partialis* foeminea (spicula) 1·6 cm. longa, 2·5 mm. lata, uniflora, basi glumis vacuis 5–6 longe acuminatis; gluma fertilis ovato-lanceolata, apice acuta, 8 mm. longa, 5 mm. lata. *Discus* 1 mm. altus, glaber. *Ovarium* cylindricum, 2 mm. altum, 1 mm. diametro, glabrum; stylus (cum stigmatibus) 1·3 cm. longus, infra

glaber, superne adpresse hirsutus; stigmata 3, 5 mm. longa. *Nux* ovoidea, 5 mm. alta, 3·5 mm. diametro, laevis, alba.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 4115.

1500. **Scleria induta,** *Turrill* [Cyperaceae-Sclerieae]; affinis *S. Barteri,* Boeck., sed spiculis longioribus, nucibus majoribus praecipue distinguitur.

Rhizoma horizontale, squamis brunneis valde nervosis haud fibrosis obtectum. *Culmi* erecti, numerosi, triangulares, circiter 6 dm. alti, 2·5 mm. diametro, hirsuti, parte inferiore foliorum vaginis integris distincte hirsutis obtecti. *Folia* linearia, apice acuta, usque ad 2·3 dm. longa et 4 mm. lata, plus minusve hirsuta vel fere glabra, pagina superiore sulcata, costa valde impressa, nervis lateralibus conspicuis, inferiore costa acute carinata nervis lateralibus inconspicuis. *Inflorescentia* plus minusve ovoidea, circiter 5·5 cm. longa et 3·5 cm. diametro; rhachis hirsuta; bracteae inferiores foliis similes, superiores anguste lineares, hirsutae. *Inflorescentia* partialis mascula (spicula) circiter 14-flora, 9 mm. longa, 2 mm. lata, basi glumis vacuis 4 longe acuminatis instructa; florum fertilium glumae oblongo-lanceolatae, circiter 7 mm. longae et 2 mm. latae. *Stamina* 3, antheris linearibus apiculatis 4 mm. longis, filamentis 6 mm. longis. *Inflorescentia partialis* foeminea (spicula) 1·4 cm. longa, 2 mm. lata, uniflora, basi glumis vacuis 6 acuminatis instructa; gluma fertilis ovato-lanceolata, 1 cm. longa, 6 mm. lata. *Discus* 0·75 mm. altus, glaber. *Ovarium* cylindricum, 2·5 mm. altum, 1 mm. diametro, glabrum; stylus glaber; stigmata 3. *Nux* ovoidea, 4 mm. alta, 2·5 mm. diametro, laevis, alba.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 3658, 3757.

XXI.—MISCELLANEOUS NOTES.

Mr. H. W. Jack.—Mr. H. W. Jack, B.A., B.Sc., of University College, Cork, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, an Assistant Agricultural Inspector in the Federated Malay States.

Mr. M. Free.—We are informed that Mr. M. Free, formerly a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed Head Gardener of the Brooklyn Botanic Garden, New York.

Mr. H. E. Downer.—We learn that Mr. H. E. Downer, formerly a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed, on the recommendation of Kew, Head Gardener at the Botanic Gardens, Smith College, Northampton, Mass., U. S. A.

Presentation of a portrait of Linnaeus.—A framed portrait of Linnaeus has been presented to the Herbarium by Sir Arthur Church, K.C.V.O. It is a very good impression of an old French colour-print by P. M. Alix after A. Roslin, and bears the imprint "A Paris chez Drouhin, Editeur & proprietarie des Antiquities Nationales, Rue Christine No. 2, et imprimes chez lui par Bechet." The portrait is a half-length one and represents Linnaeus clad in wig and dark fawn-coloured coat and vest, through the opening of the latter protrudes a delicate white frill, while on the left-hand side of the coat hangs the Order of the Polar Star, with a sprig of *Linnaea borealis* above it. The figure is turned slightly to the left, and its face is directed towards the spectator; the whole is enclosed in an oval $9\frac{3}{4}$ in. by $8\frac{1}{4}$ in. The picture bears some resemblance to that by A. Roslin in the Royal Swedish Academy of Sciences at Stockholm (but laterally inverted), a print of which has been published in the Proceedings of the Linnean Society of London, 1905–6, plate 8.

Botanical Magazine for March.—The plants figured are *Aristolochia gigantea*, Mart. (t. 8542); *Ribes laurifolium*, Janczewski (t. 8543); *Salvia uliginosa*, Benth. (t. 8544); *Kniphofia carinata*, C. H. Wright (t. 8545) and *Cotoneaster turbinata*, Craib (t. 8546).

Aristolochia gigantea is a Brazilian species, a plant of which has been presented to the Kew collection by Sir Frank Crisp. From this has been obtained the material for the illustration. The flowers are mainly brownish-purple, with pale yellow reticulations, and are noteworthy on account of their fragrance, thus being markedly different from the other species in cultivation. The perianth-limb is deeply cordate, has no tail, and is 9 in. long by about 6 in. wide. In the Palm House at Kew the plant is trained against the roof and forms annual shoots 15 ft. or more in length.

Ribes laurifolium has been introduced as a result of Mr. E. H. Wilson's mission to China on behalf of the Arnold Arboretum. Seeds were collected in Western Szechuan, and some were presented by Professor Sargent to Kew, to the Royal Botanic Garden, Glasnevin, and to Mr. Vicary Gibbs. The material for the figure was obtained from all of the three sources named. It is an unarmed shrub, with ovate or ovate-oblong serrate-crenate coriaceous leaves, $2\frac{1}{4}$–4 in. long, $\frac{1}{4}$–2 in. wide, pendulous racemes, 1–$1\frac{3}{4}$ in. long, of greenish flowers, and reddish tomentose broadly elliptic fruits about $\frac{2}{3}$ in. long. The plant is quite hardy in the British Islands, but so far has proved of slow growth.

The *Salvia* is an attractive species, native of Brazil, Uruguay and Argentina, and hardy at Kew, to which a plant was presented in 1912 by Mr. P. L. de Vilmorin, of Verrières, Seine and Oise. The stem of *S. uliginosa* is conspicuously sulcate quadrangular—a characteristic feature, as well as that of the deep serration of the leaves. Its flowers are bright blue, with some white marks on the base of the lip, and are borne in compact terminal spiciform racemes.

Kniphofia carinata is a new species allied to *K. comosa*, Hochst., from which it differs in having yellow filaments almost as long again as the perianth. Seeds of this plant were sent to Kew in 1892 by Miss Ayliff, of Grahamstown, South Africa, but flowers were not produced till September, 1912. It appears to be less hardy than the majority of Kniphofias in cultivation.

Cotoneaster turbinata is another addition to a genus of which our knowledge has increased considerably during recent years as a result of the more thorough botanical exploration of China. This species is a native of Hupeh, and the first plants obtained in Europe were raised from seeds sent by the Abbé Farges to Mr. M. L. de Vilmorin, from whom the Kew plants were received in 1910. It appears to be a hardy and vigorous species, and is of particular value in the garden on account of its habit of flowering six to eight weeks later than any other cultivated *Cotoneaster*.

Botanical Magazine for April.—The plants figured are *Hibiscus Waimeae*, A. A. Heller (t. 8547); *Gladiolus Masoniorum*, C. H. Wright (t. 8548); *Berberis Prattii*, C. K. Schneider (t. 8549); *Olearia semidentata*, Dcne. (t. 8550) and *Epidendrum profusum*, Rolfe (t. 8551).

The *Hibiscus* is a remarkably beautiful plant from the Hawaiian Archipelago which was obtained for the Kew collection by purchase under the name of *H. Arnottianus* in 1911 from a Californian Nursery company. The flowers are large and pure white, with a conspicuous crimson, lax staminal column. *H. Waimeae* belongs to the group of species which includes *H. Rosa-sinensis*, Linn., and has been named *Lilibiscus* by Hochreutiner. An account of *H. Arnottianus* and the confusion that has arisen in connection with the name was published in *K. B.*, 1914 pp. 45–47.

Gladiolus Masoniorum was discovered in Tembuland in December, 1910, by Canon G. E. Mason of Umtata, and his sister Miss M. H. Mason, in compliment to both of whom it has been named. Material was sent to the Cambridge Botanic Garden, and the plant which flowered there furnished material for the plate. The flowers are cream-coloured with a greenish tint inside the lower part of the tube. *G. sulphureus*, De Graaf (*see* t. 7791), is the nearest ally of the Tembuland Gladiolus.

Berberis Prattii is yet another of the many interesting and beautiful plants of this genus recently introduced from China. This species is a native of Western Szechuan, and was first collected by Mr. A. E. Pratt near Tachien-lu, and later was found by Mr. E. H. Wilson. This species was originally included in *B. polyantha*, Hemsl., but Schneider separates it on account of its less closely reticulated leaves and narrower inflorescences. It very closely resembles *B. paniculata*, C. K. Schneider, with which it is often confused, but may be easily distinguished by the lower surface of leaves being pale green and not glaucous. It is a remarkably effective plant when the branches are laden with the salmon-red fruits in September.

The specimens of *Olearia semidentata* which afforded material for the plate were yielded by plants brought from the Chatham

Islands to Tresco by Captain A. A. Dorrien Smith, and a plant flowered in July, 1913. *O. chatamica*, T. Kirk, already figured in the Magazine (t. 8420), is the nearest ally to this species, and grows in association with it in boggy places in the Chatham Islands. In its native habitat *O. semidentata* exists in two colour varieties, according to Capt. Dorrien Smith, one having white and the other pink flowers. The plant figured bears the purple flowers of the type.

Epidendrum profusum is a very attractive orchid which was obtained for the Kew collection by purchase from Messrs. Sander and Sons, St. Albans, in 1911. It is assumed that its native country is Mexico since it was introduced under the name *E. Candollei*, Lindl., which is that of a Mexican species. (*E. Candollei* was figured at t. 3765 of the Magazine under the name *E. cepiforme*, Hook). *E. profusum* is most closely allied to *E. aromaticum*, Batem., and to *E. ambiguum*, Lindl., but differs from the latter especially in having a denser panicle with shorter and broader sepals and petals.

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* **Rubber.**—The history of the development of the important Para Rubber industry in the East teems with interest and more or less with romance. The initial difficulties of procuring seeds in the Seventies from the Amazon region, the raising of plants at Kew, and their despatch to our Eastern Colonies are facts of common knowledge. During more recent years, as the acreage under rubber increased and the industrial applications of the product extended, the need for trustworthy works of reference and guidance to planters has been met, and good standard works on the subject are now available at low cost.

In "Rubber and Rubber Planting," by Dr. R. H. Lock, we have a concisely written book embracing the whole subject from the early history of the use and cultivation of rubber, botanical sources, physiology of latex production, tapping experiments, planting, harvesting, factory work on the estate, pests and diseases, chemistry of rubber, manufactures, etc.

The aim of the author has been "to combine an accurate account of the scientific side of rubber planting with a certain amount of practical information which may be of use to the prospective planter." The chapters on the physiology of latex are largely the outcome of original observations, whilst those on the subjects of planting, harvesting and factory work on the estate are likewise based on a close personal acquaintance with the industry in Ceylon. The book has a number of useful illustrations and a good index, and forms a most useful addition to the literature of rubber.

J. M. H.

† **Cocoanuts.**—Probably at no other time than the present has

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* Rubber and Rubber Planting, by R. H. Lock, Sc.D., pp. xi. and 245, with 10 plates and 22 text figures. Cambridge, at the University Press, 1913. 5s. net.

† Coconuts: The Consols of the East, H. Hamel Smith and F. A. G. Pape, pp. lxviii and 644, with illustrations and index, London Tropical Life Publishing Department.

so much attention been directed to the vegetable kingdom for new sources of seeds yielding edible fatty oils and also to the extended cultivation of those already of commercial importance.

In the Palm family there are many fruits with oily kernels that might be applied to industrial use, but, generally speaking, there are difficulties in the way of obtaining regular supplies in quantity, and the fruits being often extremely hard in texture, special machinery, which is not always available, is needed to extract the kernels without damage.

With regard to Copra, which is the dried kernel of the Cocoanut Palm (*Cocos nucifera*), there is an increasing demand for the product, and during the last few years the extended cultivation of this palm has been most marked.

The uses to which all parts of the Cocoanut Palm are applied in the tropics are too numerous to give even a brief outline of them in this note, but in western commerce, beyond the fibre known as Coir, obtained from the husks, the nuts, kernels and oil extracted therefrom, comparatively little is known.

The recently published book "Coconuts, the Consols of the East," is a handy volume dealing primarily with the subject of cocoanut cultivation and the preparation of its products for the market. In addition, many important subjects are discussed of general interest to the planter. In the introduction the subject of "Health in the Tropics" forms not the least important feature of the book. This is followed by chapters dealing with the cost of a cocoanut estate, native ownership and husbandry, locality and site, cocoanut cultivation in Ceylon, Malaya, West Indies, Philippines, etc.; cleaning and preparing the land for planting, care and upkeep, diseases, catch crops and cover plants, Copra and its preparation. Other subjects handled are farming with dynamite, extraction of oil, mechanical extraction of fibre, spraying machines, etc.

From the foregoing it will be seen that the work covers a wide field of subjects; some of the illustrations are rather poor, but the book is well printed, has an excellent index, and should certainly form a valuable handbook to the planter and others interested in tropical produce.

J. M. H.

Atlas of the Flora of Algeria.—It is a pleasure to record the continuation of the "Atlas de la Flore d'Algérie." Commenced by Battandier and Trabut as "Atlas de la Flore d'Alger" in 1886, it was continued in 1895 by the same authors as "Atlas de la Flore d'Algérie," with fascicle 2 (plates 12–23) with which it ceased for the time. Now it has been taken up again by Professor Trabut, who carries it to plate 46 (fascs. 3 and 4, plates 24–46).

In the preface to the first fascicle it was stated that the Atlas would be confined to plants not figured elsewhere, and further that accuracy and analytical detail rather than artistic perfection would be aimed at, so that the price could be kept low enough for the many. The same principle has been applied to the present fascicle and even extended to the mode of reproduction which

varies almost from plate to plate, but is mostly done by some sort of photographic process. It may be regretted that there was not sufficient financial support forthcoming for a handsomer and more uniform mode of publication; but in the absence of it, the author deserves all credit for this valuable supplement to Battandier and Trabut's "Flore de l'Algérie. O. S.

The Date Palm.*—The present book, which is no doubt the most important publication on the subject, is based on a considerable amount of literary research and practical experience gained in the date palm plantations of California and Arizona, and on observations made by the author during two years of travel in the date-growing countries of the Orient and North Africa. It is the latter circumstance which gives the book its importance as a mine of information and practical hints.

It is written with remarkable freshness and directness, and interest is well sustained throughout the volume. After a brief discussion of the history of the date palm, the author deals with the countries in which the palm is grown, the commercial conditions of its cultivation and its cultivation in general, its propagation by offshoots and seeds and its pollination; then follow chapters on the handling of the crop and artificial ripening, on diseases and pests, the classification of dates, the profits of date growing and the uses of the date in and outside its home. A list of varieties, with descriptions of them, runs to over 90 pages, and yet it is merely a selection of the most important ones.

In America date cultivation is limited at present to certain parts of California and Arizona and to a small district in Texas, but there must be much land in Northern Mexico suitable for that purpose. It may be expected that the book will act as a very effective stimulus for the extension of date growing in America, as well as in other parts of the world and for improvement in the treatment of the palm and the selection of its varieties in its own home. O. S.

The Banana.†—This book fulfils a want that has grown with the remarkable development in the trade in a fruit so universally popular.

From the cutting of the bunch to the retailing of the hands and single fruits in our streets, the regulation of the times of cutting, carriage, storage, delivery and distribution is an elaborate system, requiring probably more skill than the growing of the plant itself. The two kinds chiefly grown are *Musa sapientum*, L., var. "Gros Michel," cultivated largely in Jamaica, Costa Rica and other

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* Date-Growing in the Old and New Worlds, by Paul B. Popenoe, pp. 297 with 3 appendices and 40 plates. West India Gardens, publishers, Altadena, California. $2 00 net. 1913.

† "The Banana: Its Cultivation, Distribution and Commercial Uses," by William Fawcett, B.Sc., F.L.S., pp. i.-xi. 1–287, illustrated; Duckworth & Co., London, 1913; 7s. 6d. net.

parts of Central America, and *Musa Cavendishii*, Lam., the "Canary Banana."

In the present work descriptions of 66 species of *Musa* are given. In the sub-genus *Eumusa*, the two kinds above mentioned and the "Manila Hemp Banana" (*Musa textilis*, Nées) are the best known and most useful representatives.

There are 34 chapters dealing with general cultural details, fungous and insect pests; bananas as food and in medicine; drying, trade, transport; wine, whisky, alcohol and fibres from bananas; a general review of cultivation throughout the tropics; horticultural and botanical notes; banana allies; species of *Musa*, and an appendix giving recipes for cooking the fruits.

Seventeen illustrations are given, including two reproductions of "A Banana Plant," from Hughes, "History of Barbados" (1750), and Labat, "Nouveau Voyage aux Isles de l'Amerique" (1721), and several modern photographs. A few illustrations of the various kinds of suckers would have enhanced the value of chapters iii. and vi. on "Planting, Pruning and Treatment of Suckers," since "maiden suckers," "sword suckers," "followers," "ratoons" and "peepers" are mentioned. Most of chapter vi. is extracted from the Journal of the Jamaica Agricultural Society (xvi. 305, 1912), and the writer (H. Q. Levy) admits the difficulty of explaining on paper the details of the essential operation of pruning; he also states "there is no part of banana cultivation that needs as much individual attention, supervision and judgment as the pruning. The retaining of wrong suckers may mean the loss of hundreds of pounds to the large cultivator."

The chapter on Alcohol is particularly appropriate and of special value in view of the widely spread interest taken at the present time on its prospects as a substitute for petrol. The utilisation of the waste material, other than that fit only for use as manure, in such an industry is a problem of some force throughout the tropics and worthy of every consideration. It is calculated (p. 127) that in Jamaica alone over 3,000,000 bunches of bananas, value about £200,000 are produced annually, which cannot be profitably exported.

In the chapter on "Manila Hemp and other Fibres from species of Musa" reference is made to *Musa Ensete*, Gmel. of Abyssinia, grown for fibre in German East Africa; *Musa ulugurensis*, Warb. and Moritz, a new species from Uluguru, German East Africa—fibre regarded as a very useful material, value £40 per ton—and the "Wild Banana" (*Musa Livingstoniana*, Kirk) from Nairobi, British East Africa, all of which belong to the sub-genus *Physocaulis* or swollen-stemmed Musas.

When so much has been written on a subject like the present, reference to other works on the same or allied plants cannot be avoided, and the work under consideration is no exception in this respect, though every source that has been drawn upon is duly acknowledged. The book has evidently been prepared with great care and the author's many years of experience in Jamaica, referred to in the foreword by Sir Daniel Morris, is a sufficient guarantee of the value this book will be to planters and all interested in the botany, agriculture or commerce of the Banana.

J. H. H.

Handbook of Potato Diseases.*—The Department of Agriculture for Victoria has recently issued a work by Mr. D. McAlpine, Government Vegetable Pathologist, on the fungus diseases of the potato in Australia. The volume, though dealing only with diseases occurring in that continent, forms a useful contribution to the literature of the subject and will be appreciated in many countries outside Australia. There are some 100 pages of general text, 50 plates, and appendices dealing with animal pests, regulations as to potato diseases in the State of Victoria, and in the entire Commonwealth, together with data as to temperature and rainfall, factors intimately connected with the distribution of disease in a territory such as Australia. The general part is concerned with the following:—*Phytophthora infestans*, *Macrosporium Solani*, *Hypochnus Solani* (= *Rhizoctonia*), "Scab" (of which various types are distinguished), *Fusarium Solani*, *Bacillus Solanacearum*, and several other diseases of minor importance. By far the largest portion of the book is taken up with the "Irish Blight" (*Phytophthora*), a great deal of useful information being brought together, including the results of the author's own experiments and observations. The debated question of the part actually played by hibernating mycelium in the propagation of the fungus is discussed in detail. Evidence is brought forward showing the importance of this source of infection, and the author believes that in Australia it is very largely responsible for the continuation and spread of the disease.

The other maladies being less serious have not been the subject of so much enquiry, but "Scab" is treated at some length, and a few new observations are recorded. The subject of spraying and disinfection of "seed" also receives attention. It is worthy of note that two of the worst diseases in this country, namely, Wart Disease (*Synchytrium endobioticum*) and Corky Scab (*Spongospora scabies*) are not known in any part of Australia.

A. D. C.

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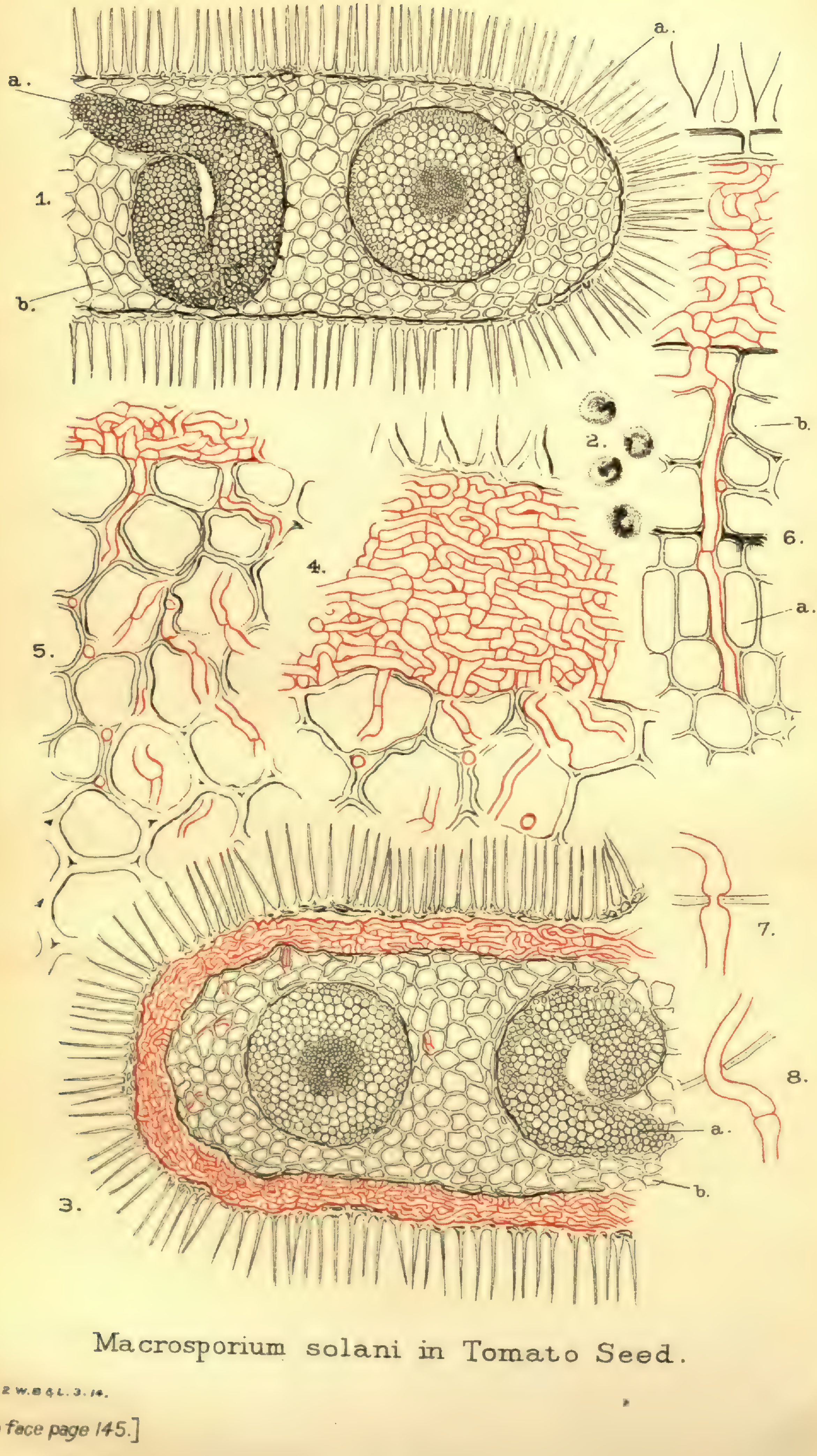
*Handbook of Fungus Diseases of the Potato in Australia and their Treatment, by D. McAlpine, pp. iii.+215, with 158 figures and a map. Department of Agriculture, Victoria.

[New Bulletin, 1914.



Macrosporium solani in Tomato Seed.

212 W.B & L. 3. 14.

To face page 145.]

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4] [1914

XXII.—ON THE PRESENCE OF HYBERNATING MYCELIUM OF MACROSPORIUM SOLANI IN TOMATO SEED.

I. Massee.

(WITH PLATE.)

It has long been suspected by tomato growers that the germ of "black-rot" of tomatoes, *Macrosporium solani*, Cke., was carried in the seed, but, so far as I am aware, the actual presence of mycelium in the seed has not been previously demonstrated. When tomatoes are attacked by "black-rot," the seeds often show black spots on the surface. Massee* proved that when such seed was sown, either no germination took place, or else the resulting plants often showed "stripe" disease. Microtome sections of such spotted seed proved the presence of mycelium in varying quantities. In a healthy tomato seed the testa is in close contact with the endosperm, but in an infected seed a thick weft of closely compacted hyphae is present between the testa and the endosperm. When a tomato is badly infected with "black-rot" the mycelium extends deeply beneath the diseased patch, and in many cases the placentas are completely permeated with a dense weft of mycelium, which causes them to become quite black. As would be expected, the seeds borne on these blackened placentas are also often attacked by the mycelium, which enters through the micropyle. The weft of mycelium is sometimes of uniform thickness all round the endosperm, in other instances the thickness of the weft varies at different points, and sometimes it is confined to one or two isolated patches. The hyphae are colourless, septate, and of variable thickness, averaging 4–5 μ. From this peripheral weft of mycelium hyphae pass into the endosperm and also into the embryo. These hyphae are both inter and

* Massee, G. Journ. Board Agric. vol. 13, p. 232 (1906).

(3237.) Wt. 225–595. 1,125. 5/14. J. T. & S. G. 14.

intra-cellular, of about the same thickness as the peripheral mycelium, sometimes closely septate, sometimes sparingly so. The hyphae probably dissolve the very thin walls of the cells by means of a ferment, as described by Marshall Ward in his account of the perforation of the cell walls by the *Botrytis* in a "Lily Disease."† When the tip of a hypha comes in contact with a cell-wall it becomes flattened and rather swollen, and a thin portion from the centre of the flattened part in contact with the cell pierces the wall, and swells up at the opposite side to the normal thickness of the hypha. In other instances the hyphae appear to pass through the wall without any preparatory flattening and swelling. No haustoria are present

On the germination of infected seed, one of two things may happen; either the embryo is killed almost at once by the mycelium, when present in considerable quantity, or the mycelium grows along with the seedling, in whose tissues hyphae can be distinctly traced. In such infected seedlings the "stripe" form of the disease has been produced before the plants were two months old, when grown under favourable conditions for the rapid development of the fungus, namely, an excess of heat and moisture. Sections of diseased seed which had been kept dry for some months, when placed on damp filter-paper in a Petri-dish, were soon surrounded by a copious development of hyphae, showing that the mycelium present in the seed retains its vitality for a considerable period of time.

In many instances, when the seed produced by a diseased tomato does not contain mycelium in its substance, it is surrounded by a weft of hyphae which cannot be removed in the ordinary process of cleaning, being held in position by the dense coat of hairs covering the testa. This external mycelium is also a source of danger, and the only certain means of avoiding disease due to infected seed is to reject all seed produced by diseased fruit, even if it does not show the black spots.

Explanation of the Plate.

Fig. 1.—Section of portion of a sound tomato seed, showing parts of the coiled embryo (*a*) and endosperm (*b*); × 75.

,, 2.—Diseased seeds of tomato, showing black patches on the testa; × 3.

,, 3.—Section of portion of a diseased tomato seed. The mycelium is coloured red.

,, 4.—Section of portion of a tomato seed showing a weft of mycelium situated between the testa and the endosperm, hyphae from this weft are seen passing into the tissue of the endosperm. Mycelium coloured red. × 400.

,, 5.—A similar section of fig. 4, showing the mycelium permeating the endosperm. Mycelium coloured red. × 400.

,, 6.—A strand of mycelium entering into the embryo (*a*) from the endosperm, (*b*) mycelium coloured red. × 400.

,, 7 and 8.—Methods by which the hyphae pass through the cell-wall. Mycelium coloured red. × 400.

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† Ann. Bot., 2, p. 319 (1889).

XXIII.—THE CULTIVATION OF THE SUGAR CANE IN SOUTHERN SPAIN.

The following information concerning the sugar-cane industry in the Province of Andalusia has been supplied to Kew, in reply to our request for information, through the courtesy of H.M. Secretary of State for Foreign affairs:—

Madrid,
February 26th, 1914.

SIR,

In reply to your despatch No. 44 of this series of the 11th of July last I have the honour to forward a report on sugar cane cultivation in Southern Spain which I have received from His Majesty's Consul at Malaga on the subject.

I have the honour to be, &c.,
(Signed) ARTHUR H. HARDINGE.

The Right Hon.
Sir Edward Grey, Bt., K.G., M.P., &c.

British Consulate,
Malaga
February 24, 1914.

SIR,

I have the honour to enclose herewith, as requested, a report on the cultivation of sugar in this Consular District. So far as I have been able to ascertain there are no official or scientific records of the growth of sugar here. The correct names of the canes do not seem to be known to the growers. They are spoken of by descriptive terms. Should it be considered worth while I could no doubt collect samples of the canes from various plantations and send them to England for analysis and classification. The notes from which my report was written were derived from various persons interested in the cultivation of sugar cane, including the manager of a very large estate, holding the position of an agricultural expert. I am, moreover, particularly indebted to Mr. Vice Consul Murison, of Almeria, for a full report on the one surviving plantation in his district.

As will be seen from the report itself, the evidence and opinions expressed are not infrequently at variance; but I have endeavoured to set forth the main facts, and shall not fail to bear the subject in mind for further information if procurable.

I have the honour to be, &c.,
M. VILLIERS,
H.M.'s Consul.

His Majesty's Ambassador,
Madrid.

REPORT ON THE CULTIVATION OF SUGAR CANE ALONG THE SOUTHERN SHORES OF SPAIN WITHIN THE CONSULAR DISTRICT OF MALAGA.

Where grown.—Sugar cane is grown in this district along the southern shores of Spain in the protected valleys where the temperature is never expected to fall below freezing point. In

such plantations the winter temperature usually varies from 6° to 15° C. (42° to 59° Fahr.), although some cultivators report the average temperature as being about 17° C. for the winter and 35° for the summer. The minimum altitude above sea level is given as 15 feet. The plantations extend from Estepona to Adra.

Varieties.—The kinds mentioned as most profitably grown are the White "Blanca," Violet "Morada," and Black "Negra." The "Blanca" is said to be that originally grown by the Arabs, and the "Negra" to have been imported subsequently from Cuba. Others, again, call the "Blanca" "American." The "Negra" and "Morada" appear to be much the same cane, merely called differently locally, to distinguish the dark from the white.

Other varieties mentioned in the reports I have received are "Crystalline cane," heavier than the foregoing but very poor in saccharine; a "striped cane," "of poor quality in every respect"; and the "Algarrobena," which was previously cultivated, but has been almost entirely set aside.

In some districts where sugar used to be grown, it is not so any longer. This may be partially accounted for by reluctance to persevere with the most suitable kinds when the kind previously grown no longer proved remunerative. In the province of Almeria, for instance, "outside the limited district of Adra no sugar cane is grown in the province. For a few years cultivation of the cane was tried here, but as the result proved in every way unsatisfactory it was given up, now over 20 years ago," writes the Vice-Consul.

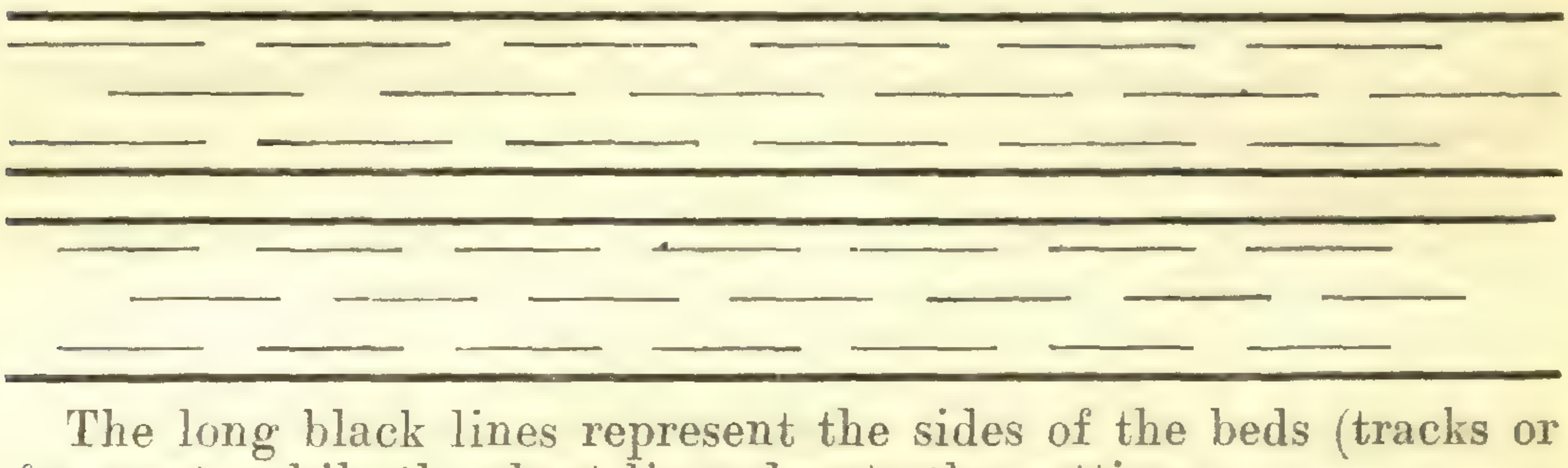
Reasons for preferring certain varieties.—Opinions seem to differ as to the frost-resisting powers of the various kinds. I am told, for instance, as regards the districts of Marbella and Estepona, "the Violet cane is preferred for its strength against frosty weather, the plantation of the white being, therefore, very insignificant." Whereas the report on the plantations at Adra is, "American white is preferred because . . . . it best resists low temperature."

But there are other questions to consider in planting cane besides the danger of frost, and the concensus of opinion appears to be that the "Negra is preferred on good soil because it is more luxuriant, one crop being gathered each year"; but "Blanca is preferred on poor soil because the crop takes place only once in two years, the growing properties during the second year being extraordinary." The said poor soil being usually calcareo-silicious. The Vice-Consul at Almeria reports, however, of the Adra plantation, "The American white is preferred because it gives more weight, is richer in saccharine, and (as already quoted) because it best resists low temperature."

Nature of soil—The soil of the sugar plantations is described as "soft, silicious, with permeable subsoil, naturally rich in nitrogen, on account of being, as a rule, the sedimentations of old rivers." The Adra plantation, already mentioned, is described as "sediment left when the river overflows its banks during heavy rains; in a few fields is limy, and in one small part is of a sandy nature."

How planted and how cultivated.—A full description of the method of planting and cultivating has been written by Mr. Vice-Consul Murison (Almeria), as follows:—

(Describing Adra).—The land is first well manured and ploughed. After ploughing it is smoothed or flattened down by a plank or board used as a sort of clod-breaker, on which the driver of the mule stands to give it additional weight. Stable manure is preferred to artificial. After the ploughing and smoothing down, tracks or furrows are made with a grub-hoe, "azada." These tracks are about 33 inches wide by 8 or 9 inches deep. Cuttings of the cane, about 15 inches in length, already in a state of germination through having been covered up for some time, are then laid into them thus:—



The long black lines represent the sides of the beds (tracks or furrows), while the short lines denote the cuttings.

Three parallel lines of cuttings being placed in a track, and the cuttings are so arranged that the interstices of each row come opposite the centres of the cuttings in other rows.

These cuttings are then slightly covered with earth from the sides, and as growth continues the covering up is completed till the whole be quite flat as before the tracks were formed. During this period the land is kept free of weeds. On the flattening and weeding being completed guano or artificial manure is applied. This manuring generally takes place from the 15th to the 20th July until the 15th of August. Special care is taken before the final covering up and the application of the manure that every weed has been removed. Immediately after manuring (fertilising) the fields are irrigated and successive irrigations are given every 15 or 20 days till the period for cutting commences.

Replanting takes place every 10 or 12 years, the land, before the plants are put in, undergoing a thorough trenching with the grub-hoe, so as to bring new earth to the surface. (Others state that replanting should take place every 7 or 8 years.)

Fertilising.—In recent years additional attention has been given to the question of chemical manures or fertilisers, according to the requirements and nature of the soil. A mixture said now to be much in use has the following guaranteed richness in radicals:—

Ammonic and nitric nitrogen—7–8 per cent.
Potas. anh.—10 per cent.
Phosphoric acid—10 per cent.

This is applied once or twice during the growth and ripening of the cane in tremendous quantities, as much as $1\frac{1}{2}$ tons for $2\frac{1}{2}$ acres (1500 kgs. per hectare).

Irrigation.—Irrigation should be resorted to every 15 or 20

days during the summer; and during the winter, that is the time of year when rain falls, whenever considered necessary. When plantations are situated on the banks of a river every effort is made to get the fine sediment brought down by the river when in flood well spread over the land.

Irrigation is by means of the old-fashioned conduit system. The plant, especially as it matures, needs water naturally in considerable quantities, and more particularly when chemical manure has been applied, in order that it may be gradually and readily absorbed by the small roots.

Season for planting and crop.—Planting takes place in the spring, the precise time varying here between March, April and May, each of these months being considered "the best," an opinion properly formed locally and based upon the variation of soil, site, etc., etc. The crop should be ready for cutting one year after planting.

Average yield.—The average yield is said to be about 40 tons for $2\frac{1}{2}$ acres. The crop from the Adra plantation is stated to be 200 arrobas (2300 kgs.) from a "marjal," or 525 square metres for the "tercio" or first year's cane, and 300 arrobas (3450 kilgs.) for the "Alija" or second year. This statement also shows the great increase of the second-year crop over the first. The density of juice is stated to be "8 degrees Beaumet," or "about "14 per cent. of the output of cane, for the district generally"; whereas at Adra "the average yield of sugar is said to be "8 per cent."

XXIV.—DECADES KEWENSES

PLANTARUM NOVARUM IN HORTI REGII CONSERVATARUM.

DECAS LXXVII.

761. **Clematis Rehderiana,** *Craib* [Ranunculaceae-Clematideae]; a *C. nutante,* Royle, filamentis pubescentibus recedit.

Frutex scandens; ramuli primo sericei, mox sparse crispatim pubescentes, sulcati. *Folia* pinnata, petiolo usque ad 6·3 cm. longo, indumento ramulorum suffulta; foliola 3–4-juga, ambitu late ovata vel juniora ovato-lanceolata, apice acute acuminata, basi saepissime cordata, usque ad 7 cm. longa et 5·5 cm. lata, saepius trilobata, rarius latere uno fere usque ad basin secta, grosse dentata, dentibus mucronatis, chartacea vel tenuiter chartacea, subtus pallidiora, pagina superiore pilis albidis adpressis plus minusve deciduis instructa, inferiore densius molliter subsericea, e basi trinervata, nervis supra demum saepe immersis subtus prominentibus, petiolulis ad 2·2 cm. longis suffulta. *Inflorescentia* axillaris, paniculata, satis compacta, pedunculo communi usque ad 10·5 cm. longo primo densius adpresse albopubescente mox parce crispatim pubescente sulcato suffulta; ramuli inferiores usque ad 5 cm. longi, interdum bractea foliacea trilobata instructi; bracteae ramulorum superiorum membranaceae, pallidae, integrae vel apice tridentatae, plerumque circiter 1·5 cm. longae; pedicelli circiter 7–8 mm. longi. *Sepala*

1·7 cm. longa, 5·5 mm. lata, apice saepe reflexa, inferne plus minusve cohaerentia, extra pilosa, intus glabra. *Filamenta* 1 cm. longa, ima basi glabra, ceterum tenuiter pilosa, antheris 2·5 mm. longis muticis. *Ovarium* sericeum, stylo plumoso circiter 1 cm. longo. *C. nutans*, Beckett in Gard. Chron. vol. xlviii. p. 310 f. 129; Bean in Kew Bull. 1910 p. 392, vix Royle. ?*C. Buchananiana*, Finet et Gagnep. in Bull. Soc. Bot. Fr. sér. 4, vol. iii. p. 541; Contrib. Fl. As. Or. vol. i. p. 26. *C. Buchaniana*, var. *vitifolia*, Bois in Journ. Soc. Hort. Fr. sér. 4, vol. i. p. 866; L. Henry in Rev. Hort. 1905, p. 437, fig. 180. *C. nutans*, var. *thyrsoidea*, Rehder et Wilson in Sargent Pl. Wilson. vol. i. p. 324, excl. Wilson 1422 (seed number).

China. Western Szechuan, Tachienlu, *Wilson* 3120, 3120A, 2120B. (Veitch Expedition), Soulié 450, *Pratt* 592 pro parte. Cult. Hort. Kew (211–04, *Lemoine* type).

762. **Clematis Veitchiana,** *Craib* [Ranunculaceae—Clematideae]; a *C. Rehderiana*, Craib, foliis gracilioribus bipinnatis, bracteis parvis recedit.

Frutex scandens; ramuli primo sericei, mox parce subadpresse pubescentes, sulcati. *Folia* bipinnata, petiolo communi ad 5·2 cm. longo indumento ut ramulis suffulta; pinnae ad 4-jugae, trifoliatae vel rarius pro pinnis inferioribus foliola trilobata tantum; foliola saepius ovata vel ovato-lanceolata, apice acute acuminata, basi late cuneata, rotundata, truncata vel leviter cordata, usque ad 5 cm. longa et fere 3 cm. lata, chartacea vel tenuiter chartacea, pagina utraque demum pilis albis adpressis hic illic sed nervis pagina inferiore densius instructa, nervis supra impressis subtus prominentibus, saepe trilobata, margine grosse dentata, dentibus mucronato-acuminatis. *Inflorescentia* axillaris, laxiuscula, pedunculo communi circiter 7 cm. longo sparse crispatim pubescente sulcato suffulta; pedunculi ramulorum inferiorum 3 cm. longitudine vix attingentes; pedicelli graciles, ad 2 cm. longi; bracteae omnes parvae. *Sepala* 1·5 cm. longa, 5·5 mm. lata, extra pilosa, intus glabra, ciliata. *Filamenta* tenuiter pilosa. *Ovarium* sericeum, stylo plumoso circiter 1·1 cm. longo. *C. nutans*, var. *thyrsoidea*, Rehder et Wilson in Sargent Pl. Wilson. vol. i. p. 324 quoad Wilson 1422 (seed number).

Cult. Hort. Kew e seminibus a Wilson in China occ. lectis. (641–10 Veitch).

763. **Xylosma Aquifolium,** *Sprague* [Flacourtiaceae]; affinis *X. orbiculato*, Seem., a quo foliis iis *Ilicis Aquifolii*, Linn., similibus, carpellis 6–7 distinguitur.

Ramuli cinerei, glabri, 3–4 mm. diametro 12–15 cm. infra apicem. *Folia* heteromorpha, ea ramulorum sterilium oblonga, utrinque angustata, 9–11 cm. longa, 3·5–4·5 cm. lata, apice acuta, basi obtusa vel rotundata, valde spinoso-dentata, ea ramulorum fertilium elliptico-oblonga, elliptica vel ovata, apice acuta vel saepius obtusa, 5–8 cm. longa, 2·5–4 cm. lata, espinulosa, dentibus parvis paucioribus vel interdum omnino deficientibus; folia omnia rigide coriacea, glabra, pagina superiore basi utrinque glandul fera, nervis lateralibus majoribus utreque latere costae

6–7, exsiccando utrinque praesertim subtus prominentibus, rete venularum supra prominulo subtus prominente; petioli 6–8 mm. longi, supra leviter excavati; stipulae minutae, triangulares. *Racemi* in axillis superioribus orti, circiter 2 cm. longi, ad 6-flori; bracteae oblongae, 5–7 mm. longae; pedicelli 4–5 mm. longi. *Sepala* 7–11, imbricata, late ovata, cuspidata, 2 mm. longa et lata, extra glabra intus velutina. *Staminodia* pauca vel nulla, ad 3 mm. longa; antherae effoetae late ovatae. *Discus* e glandulis numerosis oblongis contiguis constans. *Ovarium* subglobosum, 3 mm. diametro, glabrum, 1-loculare septis 6–7 valde intrusis; styli 6–7, crassi, cum stigmate capitato 1·5 mm. longi; ovula circiter 5, ascendentia. *Fructus* depresso-globosus, exsuccus, indehiscens, circiter 2 cm. diametro, septis persistentibus, stylis persistentibus coronatus.

Hab. unknown. Described from specimens received from the Curator, Botanic Gardens, Melbourne, where the species is cultivated. Well distinguished by its holly-like foliage, the pair of glands at the base of the blade, the short racemes, and the hexamerous or heptamerous ovary. Its nearest ally seems to be the Fijian plant described by Seemann, Flora Vitiensis, p. 7, under the name *Xylosma orbiculatum*. This has large orbicular or ovate leaves, and is probably specifically distinct from *X. orbiculatum*, Forst., a native of Savage Island, which has small obovate leaves.

764. **Dunbaria gracilipes,** *Lace* [Leguminosae-Phaseoleae]; a *D. conspersa*, Benth., pedicellis longis gracilibus facile distinguenda.

Caules sublignosi, volubiles, graciles, tenuiter canaliculati, densius puberuli. *Folia* trifoliolata, petiolo communi usque ad 4 cm. longo supra canaliculato infra parum sulcato indumento ut caulibus tecto suffulta; stipulae persistentes, lineari-lanceolatae, saepissime reflexae, circiter 3 mm. longae; foliola lateralia inaequilatera, latere altero dimidiatim rhomboideo-ovata, altero lanceolata vel ovato-lanceolata, apice acute acuminata, basi saepissime magis minusve rotundata, ad 5·6 cm. longa et 3·2 cm. lata, terminalia usque ad 1·3 cm. a lateralibus distantia, rhomboidea lateve rhomboidea, apice acute acuminata, basi obtuse cuneata ad rotundato-cuneata, ad 6·7 cm. longa et 5·7 cm. lata, omnia membranaceo-chartacea, supra tenuiter puberula, subtus pallidiora, densius breviter molliter pubescentia glandulosaque, e basi trinervia, nervis secundariis (e costa ortis) utrinque 2–3 pagina utraque prominentibus, nervis transversis infra prominulis, dense ciliolata; petioluli circiter 2 mm. longi; stipellae deficientes. *Racemi* ad 7·5 cm. longi, pedunculo communi 5·5 cm. longitudinis attingente indumento ut caule suffulti; pedicelli ad 1·8 cm. longi, pubescentes glandulosique; bracteae ante anthesin deciduae, oblongo-ovatae, acuminatae, ad 1 cm. longae, utrinque puberulae. *Calyx* 7–10 mm. longus, extra pubescens glandulosusque, tubo intus fere glabro; lobus infimus lanceolatus, acuminatus, alios longe superans; lobi duo supremi fere ad apicem connati, partibus liberis setaceis, omnes ciliati. *Vexillum* vivum atropurpureum, rotundatum, emarginatum,

auriculatum, 1 cm. longum, 1·5 cm. latum, glabrum, stipite 0·5 cm. longo puberulo suffultum; alae vivae albae, purpureo-suffusae, oblongae, apice rotundatae, ad 8 mm. longae, auricula lineari obtusa 1·5 mm. longa basi instructae, stipite gracillimo 3–4 mm. longo suffultae; carina viva alba, inflata, in rostrum purpureum decurvum obtusum subito contracta, circiter 1·2 cm. longa, stipite 6 mm. longo suffultae. *Stamen* vexillare liberum. *Stylus* basi pubescens. *Legumen* (vix maturum), sessile, compressum, 5 cm. longum, 6–7 mm. latum, basi angustatum, apiculatum, marginibus incrassatis, pilis brevibus albis glandulisque dense tectum, 8–9-spermum.

Indo-China. Upper Burma: near Maymyo, Ani Sakan, 900 m., *Lace* 5494.

765. **Anogeissus coronata,** *Stapf* [Combretaceae]; affinis *A. Bentii*, Baker, sed foliis rotundis vel fere obcordatis, receptaculo undique pubescente, fructus alis latioribus insigniter crispo-undulatis denticulatisve distincta.

Frutex vel *arbor* (?), ramulis pubescentibus vel subtomentellis, vetustis cortice pallido tectis. *Folia* rotunda vel late obovato-rotundata vel fere obcordata, mucronulata vel apiculata, 8–18 mm. longa, 10–18 mm. lata, utrinque tenuiter incano pubescentia, nervis lateralibus subtus prominulis utrinque circiter 4 obliquis versus marginem subito prorsus curvatis; petioli 1–2 mm. longi, tomentelli. *Capituli* pedunculo tomentello 1–2 cm. longo suffulti, sub anthesi 1–1·2 cm. diametro. *Receptaculi* tubus 3–4 mm. longus, basi iam sub anthesi alatim dilatatus, praeter alas fulvo-pubescens, limbus cupularis, 5-dentatus, 2–2·25 mm. diametro, extra intraque fulvo-pubescens, diu persistens, disci squamae rotundatae, longe pilosae. *Fructus* late alatus, cum alis glabris margine crispo-undulatis denticulatisve 6–7 mm. latus, 3 mm. altus, receptaculo persistente coronatus.

India. Rajputana: Merwara, in forests, *Duthie* 4663.

766. **Ardisia gracilis,** *Lace* [Myrsinaceae-Eumyrsineae]; ab affini *A. pauciflora*, Heyne, pedunculis pedicellisque longioribus facile distinguenda.

Fruticulus erectus, ramulis juventute lepidotis mox cortice cinereo-brunneo irregulariter striato obtectis. *Folia* lanceolata, obtuse plerumque inconspicue acuminata, basi in petiolum angustata, usque ad 11 cm. longa et 2·8 cm. lata, matura chartacea, juniora tenuiora, glabra, infra parum pallidiora, glandulis parvis numerosis aequaliter distributis, costa pagina superiore impressa inferiore prominente, nervis lateralibus inconspicuis, margine integro parum recurvo; petioli 0·5–1 cm. longi, supra late haud altius canaliculati, glabri. *Inflorescentia* axillaris, gracilis, plerumque cernua, e racemis 2–4 floris umbelliformibus constituta, basi folio parvo cito deciduo induta; pedunculus communis 2–4 cm. longus; pedicelli 1·7–2·5 cm. longi, parce ferrugineo-puberuli; bracteae angustae, circiter 1 mm. longae; alabastra ovoidea, acuminata. *Calyx* circiter ad medium 5-lobatus, ferrugineo-puberulus, lobis deltoideis obtusis 1 mm. longis. *Corolla* viva pallide punicea, circiter 1 cm. diametro,

tubo calyci subaequilongo, lobis ovatis acuminatis reflexis 0·5 cm. longis glandulosis. *Filamenta* brevissima; antherae ovatae, acute acuminatae, circiter 3 mm. longae, dorso atro-glandulosae. *Stylus* glaber, stamina circiter 2 mm. superans. *Fructus* immaturus, globosus, glaber.

Indo-China. Burma: Tenasserim, Dawna Range, 1050-1800 m., *Lace* 4627, 5624, *Beddome* 114.

767. **Cotylanthera caerulea,** *Lace* [Gentianaceae-Exaceae]; ab affini *C. paucisquamae,* C. B. Clarke, nodis 6–9 brevioribus, corollae lobis brevioribus recedit.

Herba saprophytica, 4·5 8·5 cm. alta, caule solitario erecto carnoso stramineo glabro nodis 6–9. *Folia* ad squamas oppositas deltoideas acuminatas circiter 2 mm. longas reducta. *Flores* solitarii, terminales, vivi pallide caerulei. *Calyx* 2·75 mm. longus, lobis imbricatis subovatis obtusis 1·5 mm. longis basi usque ad 2 mm. latis. *Corollae* tubus 1·5 mm. longus; lobi 4, ligulati, obtusi, 3·5 mm. longi, 1·5 mm. lati. *Filamenta* 1·25 mm. longa, glabra, antheris 1·5 mm. longis poro apicali dehiscentibus. *Stylus* glaber, stamina paululo superans.

Indo-China. Upper Burma: Maymyo, 1050 m., *Lace* 5898.

768. **Thunbergia maculata,** *Lace* [Acanthaceae-Thunbergieae]; ab affini *T. lutea,* T. And., floribus majoribus maculatis, bracteolis intus calyceque haud glabris recedit.

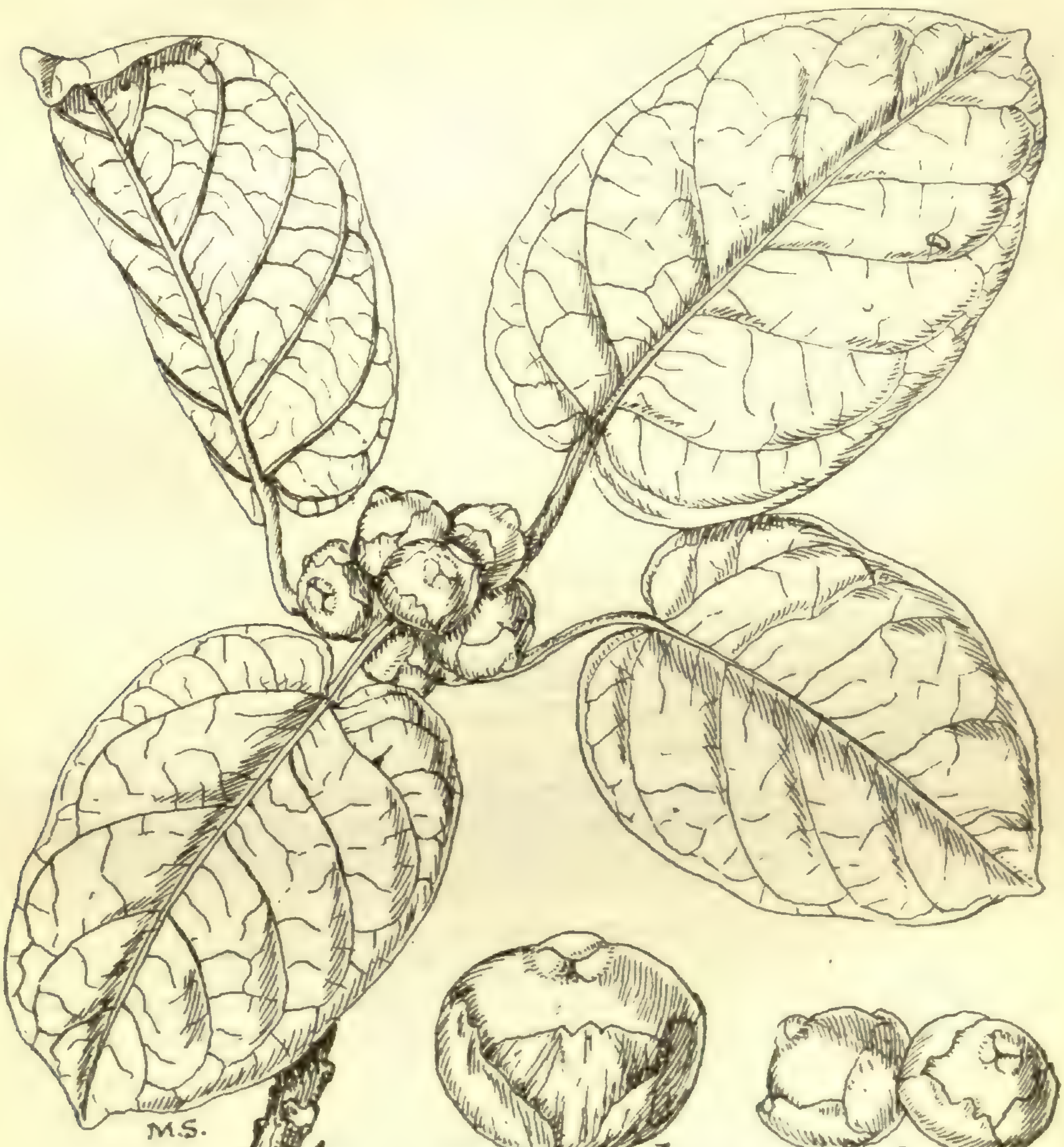
Caules herbacei, volubiles, sulcati, glabri nisi ad nodos ubi linea pilorum alborum rigidorum instructi. *Folia* ovata ad oblongo-elliptica, apice longius acute acuminata, basi acuminata, 8–13 cm. longa, 3·5–6·5 cm. lata, tenuiter, chartacea, pagina superiore pilis rigidiusculis hic illic instructa, inferiore pallidora glabraque, nervis lateralibus utrinque 3–4 arcuatis supra prominulis subtus prominentibus, nervulis uti reticulatione laxa subtus conspicuis, distanter brevissime denticulata; petioli 1·5–4·5 cm. longi, foliorum oppositorum saepe parum inaequales, supra canaliculati, glabri. *Flores* axillares, solitarii, pedicellis 4–8 cm. longis glabris parum sulcatis suffulti; bracteolae binae, orbiculares, breviter apiculatae, 2 cm. diametro, nervis distinctis, extra glabrae, intus pilis brevibus brunneis glandulosis tectae, inferne circiter ad medium connatae. *Calyx* brevius denticulatus, pilis longiusculis brunneis glandulosis tectus. *Corolla* extensa usque ad 5·3 cm. longa, viva extra pallide straminea, intus maculis elongatis plus minusve in lineas dispositis ornata; lobi inter se subaequales, rotundati, ciliati. *Stamina* inclusa, filamentis glabris; antherae acuminatae, 6 mm. (acumine 2 mm. longo excluso) longae, acumine pilis longiusculis erectis transverse septatis penicellato; loculus quisque appendicula oblonga pallida circiter 2 mm. longa ciliata instructus. *Discus* parvus, carnosus. *Ovarium* glabrum, circiter 2 mm. altum; stylus fere 2 cm. longus, glaber, breviter 2-lobatus. *Capsula* generi conformis, glabra, 3 cm. longa, basi 1·5 cm. diametro.

Indo-China. Burma: Ruby Mine District, near Mogok, c. 1200 m., *Lace* 6000.

769. **Ficus (Urostigma) cupulata,** *Haines* [Urticaceae-Artocarpeae]; *F. tomentosae,* Roxb., affinis, a qua differt habitu,

foliis siccatis supra minute reticulatis pubescentibus autem non minute tuberculatis (in *F. tomentosa* folia siccata supra glabra minute tuberculata sunt vel raro levissima sed nunquam reticulata), etiam differt receptaculo maturo purpureo, receptaculi bracteis basalibus et operculatis majoribus et floris maris perianthio gamophyllo (in F. *tomentosa* 4 sepalorum perianthium est fide King).

Arbor fruticosa 2–4 m. alta, cortice cinereo rugosissimo, ramulis foliisque novis tomentosis. *Folia* ovata, obtuse cuspidata, basi cordata, 10–13 cm. longa, 5-nervosa, utrinque minute reticulatissima et perpetuo plus minus pubescentia vel puberula, nervis lateralibus supra basin 4–6 paribus intra marginem vinctis: petioli 3–4 cm. longi. *Receptacula* subglobosa, leviter umbonata,



1–1·1 cm. diametro, juventute tomentosa, maturitate purpurea, bracteis 3 pilosis latissimis 2–3–lobatis multo imbricatis receptaculi dimidium vel ultra amplectentibus. *Floris* maris perianthium gamophyllum, stamine brevius. *Floris* feminae sepala 3–4.

India. Central Provinces: on sandstone rocks about Pach-

marhi, *Haines* 3556. Growing together with *Ficus bengalensis* and *F. tomentosa*, its nearest allies, from which it is at once easily distinguishable by the much-branched shrubby habit, and by the absence of aerial roots, in addition to the characters given above. It also lacks the curious longitudinal gland found on the midrib beneath the leaf of *F. tomentosa*, which is present in about 50 per cent. of the *F. tomentosa* leaves examined, but is not very evident in dried specimens. The name is suggested by the cup-like form of the basal bracts of the receptacle.

770. **Chamaedorea nana,** *N. E. Brown* [Palmae-Areceae]; affinis *C. tenellae*, Wendl., sed foliis majoribus confertioribus subglaucis, spathis superioribus pedunculo vix aequalibus, spadicibus masculis ramosis, floribus viridibus et petalis liberis differt.

Planta 30–60 cm. alta, omnino glabra. *Caulis* simplex, 1·3–1·4 cm. crassus, annulis 0·5–1 cm. distantibus notatus. *Folia* simplicia; petiolus 7·5–9 cm. longus, fere vel usque ad apicem vaginatus, apice 4–5 mm. crassus; lamina subobovato-elliptica, ad medium bifida, lobis acutis, leviter glaucescens, costae utrinque circa 11–nerviis, marginibus exterioribus serrato-dentatis. *Pedunculi* axillares, solitarii, 15–20 cm. longi, 2·5–4 mm. crassi, spathis vel vaginibus 5 tubulosis acutis vestiti. *Spatha* suprema pedunculo non excedens. *Spadix* masculus ramosus, ramis 4–7 recurvato-pendulis simplicibus usque ad 15 cm. longis; femineus simplex, recurvatus, viridis. *Flores* sublaxe spicati; masculi oblongi, 4 mm. longi, virides, basi lutei, calyce cupuliformi subtrilobo 1 mm. longo, petalis liberis oblongis apice incurvatis acutis, staminibus petalis duplo brevioribus ovario rudimentario subaequalibus; feminei subglobosi, 2·5 mm. diametro, virides, petalis ellipticis vel suborbiculatis obtusis concavis, ovario globoso, stylo 0·5 mm. longo, stigmate integro.

Central America. Costa Rica: Described from a plant received at Kew from Messrs. Sander and Sons. This plant was introduced from Costa Rica by Messrs. Sander and Sons, and has been distributed by them under the name of *C. pumila*, but it is quite distinct from that species in its dwarfer habit, smaller leaves, shorter petioles, &c., and comes from a different country.

XXV.—FUNGI EXOTICI : XVIII.

Eight new fungi are described in the present instalment. Of these, two are new species of *Aspergillus* taken from the soil at the Central Research Farm, Khartoum, by Mr. R. E. Massey, and sent by him in pure culture to Kew. Two other known species of *Aspergillus* were also found in the tubes sent. Two new fungi are recorded from Malaya, one, *Cypella heveae*, being said to be undoubtedly parasitic on *Hevea brasiliensis*, the other *Botrytis necans*, parasitic on the moth *Brachartona catoxantha*.

A serious banana disease has been reported from the island of Viti Levu, Fiji, by Mr. C. H. Knowles, Superintendent of Agriculture, which from the material sent to Kew proves to be due to a new species of *Cercospora*.

POLYPORACEAE.

Polyporus (Lentus) raphanipes, *Wakefield.*

Mesopus. *Pileus* glaber, alutaceus, ad 3·5 cm. diametro (in sicco), centro umbilicatus, brunneo-tinctus, marginem versus leviter adpresse fibrillosus, margine ciliato. *Pori* minuti, *albidi*. *Stipes* rufescens, primo leviter pruinatus, medio 1·5 mm. crassus, sursum in pileum expansus, deorsum abrupte incrassatus, basi fusiformi radicata; pars supera ad 2·5 cm. longa, pars fusiformis circiter 2–2·5 cm. longa, 5–7 mm. crassa. *Sporae* ellipsoideae, hyalinae, 5–7 × 3 μ.

Nigeria. Northern provinces, *J. S. Macfie* 6E, September, 1910.

Portuguese East Africa. Zumbo, *A. Cruz*. Received in 1913, through the Rev. C. Torrend.

The Nigerian specimen was previously referred somewhat doubtfully to *Polyporus Tricholoma*, Mont. (*K.B.* 1912, p. 142). The specimen from Zumbo, however, shows the same distinctly swollen base, and the African plant appears to be a good species, distinguished from the American *P. Tricholoma* by this character, and also by the slightly more fleshy pileus.

No notes are given with either of the collections, but the plant appears to have grown on buried wood, and to have reached the surface of the soil by means of the swollen sclerotium-like base, such as occurs in some species of *Collybia*. In the moist state the plant is somewhat larger than the measurements given above, which are taken from dried specimens, and the distinction between the upper part of the stem and the swollen base is not so abrupt.

Polyporus australiensis, *Wakefield.*

Sessilis, basi incrassata. *Pileus* carnosus, semiorbicularis, 5–10 cm. (vel ultra) diametro, medio 1–2 cm. crassus, basin versus ad 3 cm. crassus; cuticula levis, laete aurantiaca vel rubido-tincta, vegeto carnosa (ut videtur), sicco cartilaginea, interdum contracta, interstitiis pallidioribus. *Pori* concolores, carnosi, siccitate contracti, circa 1 mm. diametro, 2–9 mm. longi (in sicco). *Caro* pororum longitudine duplo vel quadruplo crassior, pallide luteo-aurantiaca. *Sporae* non visae.

Australia. Queensland: Coomera River, on logs, *C. T. White* (received through Mr. F. M. Bailey); Toowoomba, Grampians, *Sullivan* (in Herb. Kew as *P. portentosus*, B.); Geographe Bay (in Herb. Kew as *P. stypticus*, Fr.). Victoria: *Campbell* (in Herb. Kew as *P. retiporus*, Cke.).

A very distinct species, near to *P. sulphureus*, and said to have a very strong odour when fresh. It differs from *P. portentosus*, *retiporus*, and *stypticus*, with which it was confused in the early records quoted above, in the brilliant orange-yellow tints in pileus and pores, and in the yellowish flesh (Ridgway, tab. III, 15f).

THELEPHORACEAE.

Cyphella heveae, *Massee.*

Cupulae minutae, 0·5 mm. diametro, sparsae vel gregariae sessiles, udae cupulato-expansae, orbiculares, siccae, subglobose contractae, extus minutissime ac late puberulae, . melleae,

Hymenium, glaberrimum, subroseo-albescens. *Sporae, ellipticae*, hyalinae, 7–8×5 μ.

MALAYA. Wellesley: on bark of *Hevea*. *R. M. Richard.*

This species is said to be undoubtedly parasitic on *Hevea*. Allied to *Cyphella villosa*, Karst.

PYRENOMYCETES.

Scirrhia Cyperi, *Wakefield.*

Stromata gregaria, oblonga, epidermide diu tecta, dein erumpentia, atra, 1–4 mm. longa. *Ostiola* prominentia. *Perithecia* in unae vel duam seri lineare disposita, ad 200 μ diametro. *Asci*, clavati, 65–75×8–9 μ, octospori; paraphyses filiformes. *Sporae* subdistichae, hyalinae, fusoideae, subcurvulae, primo guttulata, dein 1-septatae, ad septa non vel vix constrictae, 17–18×4 μ.

QUEENSLAND. Nudgee: forming conspicuous, raised, blackish pustules on stems and leaves of *Cyperus polystachyus*, *C. F. White*, 1913.

Sphaerella vexans, *Massee.*

Perithecia gregaria, globulosa, minutissima, subepidermica, ostiolo vix prominulo ornata, atra, 60–70 μ diametro. *Asci* cylindracei, deorsum breve attenuato-stipitati, octospori, aparaphysati. *Sporae* ellipsoideae, utrinque obtuse rotundatae, medio 1-septatae, hyalinae, 8–9 × 3 μ.

ZANZIBAR. On livirg trees of *Eugenia caryophyllata*. *F. McClellan.*

DEUTEROMYCETES.

Aspergillus Koningi, *Oud.*

SUDAN. Appeared in a culture of fungi from soil near Khartoum, *R. E. Massey* 2 and 5.

Forming a thin olive-coloured stratum on the culture medium. Has been previously isolated from soil in Holland.

Aspergillus pusillus, *Massee.*

Maculae effusae, majusculae, griseae. Hyphae steriles, repentes, parce septulatae, hyalinae, longissimae; fertiles erectae, rectae, hyalinae, continuae, 50–75 × 3–4 μ, apice vesiculoso-inflatae, 10–12 μ diametro. Sterigmata cylindracea, 3 × 1 μ. Conidia catenulata, globosa, levia, sub lente hyalina, 1 μ dimetro.

SUDAN. A pure culture taken from soil near Khartoum, *R. E. Massey* 3 and 4.

Forming a somewhat large, grey, spreading patch on the culture medium. Distinguished by the very small size of every part of the fungus.

Aspergillus cervinus, *Massee.*

Maculae indeterminatae, pallide cervinae. Hyphae steriles effusae, ramosae, septatae, repentes; fertiles erectae, sparse septatae, hyalinae, magnitudine maxime ludentes, 80–350 × 8–10 μ apice inflato-vesiculosae. *Sterigmatia* cylindracea, obtusiuscula, 7–8 × 3 μ. *Conidia* catenulata, globosa, levia, sub lente hyalina, 2 μ diametro.

SUDAN. A pure culture taken from the soil, near Khartoum, *R. E. Massey* 6.

Forming a thin, effused, pale fawn-coloured stratum on the culture medium. Allied to *Aspergillus nanus* Mont.

Aspergillus calyptratus, *Oud.*

SUDAN. Obtained as a pure culture from soil near Khartoum, *R. E. Massey* 1.

A well-marked species, characterised by the cylindrical, elongated head, formed of crowded chains of spores. Has previously been isolated from soil in Holland.

Botrytis necans, *Massee.*

Hyphae steriles repentes, larvas demum omnino obducentes, fertiles vage ramosae, sparse septatae, subhyaline. *Conidia* in ramulorum vel denticulorum apicibus acrogena, solitaria, globosa, hyalina, 4 μ diametro, numerosissima.

SINGAPORE. On larvae of *Brachartona catoxantha.* Botanic Gardens, *I. H. Burkill.*

In a note Mr. Burkill states, "A fungus is doing for us yeoman service in checking an outbreak of the moth *Brachartona catoxantha.*" An account of the moth is given in Bulletin No. 4 of the Federated Malay States Department of Agriculture.

Cercospora musae, *Massee.*

Maculae orbiculares vel lineares, determinatae, amphigenae, sordide fusco cinerascentes, 3–6 mm. diametro; pulvinuli hypophylli, totam maculam vestientes, olivacei. *Hyphae* breviusculae, contorto-nodulosae, interdum furcatae, olivaceae, septatae. *Sporae* praelongae, vermiculariae, leniter curvulae vel flexuosae, non vel parci septulatae, 60–75 × 7–8 μ.

POLYNESIA. Fiji Islands: Viti Levu; Sigatoka. On living banana leaves, *C. H. Knowles.*

This species is considered to be the cause of a serious disease in the banana plantations in the Sigatoka district of the island of Viti Levu, Fiji. Leaves that become infected fall quite early in the season. The lowest leaf as a rule is attacked first, the leaves being infected in ascending succession.

XXVI.—THE SEX OF DATE PALM SEEDLINGS.

Attention has recently been drawn to a belief held by the Arabs that it is possible by artificial means to change the sex of seedling Date Palms and to convert male into female trees.

Reference to this belief will be found in Popenoe's recently-published book on the Date Palm,* and a note was also printed in the Gardeners' Chronicle† early in the year in connection with an article which appeared in the Tropical Agriculturist‡ of Ceylon on the subject.

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* Date-Growing in the Old and New Worlds. Paul B. Popenoe, p. 123.
† Gard. Chron. Dec. 1913, lv. p. 57.
‡ Trop. Agric. Dec. 1913, xli. p. 482.

The story in which interest has again been aroused is, however, no new one, for it was first brought to the notice of European readers as long ago as the year 1901, when Professor Schweinfurth published an article on "The Cultivation of the Date Palm" in Gartenflora* From this original source the account of the supposed change of sex has been somewhat widely, if sporadically propagated.

It re-appeared in Le Jardin of June 20th, 1902 (p. 177), without any acknowledgment of its source, and thence it has been copied into numerous Agricultural Journals, etc., becoming considerably modified in the course of years.

It will be seen from information kindly supplied to Kew by Mr. G. St. C. Feilden, Chief Gardener to the City of Cairo, that the Arabs believe that the sex of young date palms may be changed under certain conditions; but that these beliefs rest on any adequate basis of fact seems to be highly improbable.

It is alleged, however, that it is possible to tell the sex of seedling date palms before the young plants have flowered, and the information given may be of use to those who contemplate making a date plantation from seed.

Whether there be any truth underlying these Arab beliefs in the possibility of turning male date palms into female or not is really only a matter of minor importance from the economic point of view since, as Professor Schweinfurth points out in a letter sent to Mr. Feilden, the date palm is propagated almost entirely by the offshoots formed at the base of the palm. For not only is there an uncertainty as to whether a date palm seed will yield a male or a female tree, but there is also the further difficulty that the seedlings only rarely resemble their parents, and it is very unlikely that a good variety will come true from seed.

In order to try and ascertain whether the Arab belief in the change of sex of the date palm might rest on any foundation, letters of enquiry were sent to Professor Trabut at Algiers and to Mr. Feilden. From Mr. Feilden several interesting particulars were obtained in the form of answers to specific questions which he put to three prominent native growers of dates in Egypt.

He also pointed out that the belief in the change of the sex of date palms does not appear to have been an ancient one since Delile, writing on Egypt in 1824, mentions that the reason why palms were not usually grown from seed was because of the uncertainty of knowing whether the seedlings would be male or female, and that for this reason propagation by offshoots was the recognised method of raising a stock of young palms.

The following questions were put to the native growers:—

1. What percentage of seedling date palms are male?

Answers: A. 66 per cent. male.
B. 33 per cent. male.
C. 33 per cent. male.

2. Is there any way by which the sex of a young date palm can be determined?

Answers: A. The leaflets, especially the lower ones, are stiffer in the males than in the females.

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* Gartenflora, 1901, I. pp. 545–6.

B. The seedlings are covered with a light straw mat; the male seedling pushes its way through or raises the mat. The females bend sideways being weaker. In larger plants same answer as No. 1. Of seedlings planted at same time, the male grows far more quickly than the female.

C. The same answer as A.

3. Is there any way by which the young plants can be made females?

Answers: A. If the seedlings are transplanted at two years old the number of females is at least doubled.

B. Knows of no way.

C. The roots have tubercles on them. If these tubercles are removed the plant becomes female.

C. also says that if seed from dates which have been eaten is sown, the seed presumably being scraped by the teeth, more males result; if the date seed is sown uninjured the females predominate.

4. Have you ever heard of any method of tearing the leaves of the young palms to induce females?

All three growers say they have heard of no such method.

From Professor Trabut we received the following letter on the subject:—

"La légende de la transformation du dattier mâles en femelles est une légende Arabe, elle est propagée par M. le Comte de Follney propriétaire à Biskra. Je crois aucune expérience confirmative n'a été faite.

"Les Arabes opérent sur des semis dont ils ne connaissent pas encore le sexe. Jamais cette pratique n'a été employée d'une manière courante. Donc des semis il n'ya jamais plus de 50 per cent. de mâles. Pour mettre au point cette question il faudrait prendre 100 palmiers de semis—fendre les feuilles de tous en voir si de ce fait ils deviennent tous femelles.

"Jamais on n'a parlé d'opérer sur les 'offshoots,' mais seulement sur les jeunes 'seedlings,' n'ayant pas encore porté d'organes floraux. L'opération consiste à fendre la feuille suivant le rachis qui est fendu par le milieu.

"Pour complement d'information vous pouvez écrire à M. de Follney à Biskra qui vous donnera, avec plaisir une répouse détaillée.

"Mes cordiales salutations.

"(Signed) L. Trabut."

Acting on Professor Trabut's advice a letter was written to the Count de Follney in the following terms on February 14th last, but unfortunately no reply has as yet been received, and the supposed change of sex of date palms can only be regarded as a supposition believed in by the Arabs:—

"Royal Botanic Gardens, Kew,

"February 14th, 1914.

"M. le Comte,

"J'apprends par M. le Professeur Trabut à Alger que vous vous intéressez au problème de la transformation du dattier mâle

en dattier femelle, et comme ce problème est d'un haut intérêt scientifique, j'espère que vous voudrez bien avoir l'obligeance de me donner quelques renseignements à ce sujet.

"Dès l'année 1901 le Prof. Schweinfurth a donné un compte-rendu de la coutume pratiquée par les Arabes pour obtenir ce résultat, et qui consiste à fendre les feuilles des jeunes plantes de dattier.

"Comme les détails qu'il donne au sujet de cette manipulation lui ont été fournis par vous, je viens vous demander si l'essai en a été fait, par vous ou par d'autres, d'une manière suivie et pouvant donner la valeur de cette croyance des Arabes à la transformation du sexe chez le dattier.

"Puisqu'il parait que l'opération est faite sur de jeunes semis dont il est encore impossible de connaître le sexe, il semble que la seule manière de prouver la véracité de l'hypothèse serait de faire 2 semis d'au moins 100 graines de dattier chacun. On permettrait alors à un de ces semis de se développer normalement en prenant note de la proportion de mâles et de femelles produits. Tandis que l'on fendrait toutes les feuilles du second, selon la méthode décrite, et si toutes les plantes de ce second semis étaient constatées appartenir au sexe féminin, on aurait une preuve suffisante de l'efficacité de la méthode Arabe.

"Il se peut qu'un essai de ce genre ait déjà été fait par vous, et dans ce cas, j'espère que vous aurez la bonté de me donner autant de détails que possible sur le résultat obtenu. Si au contraire la croyance Arabe en est encore à l'état légendaire, j'espère qu'il serait possible pour quelqu'un intéressé dans la culture et la propagation du dattier de faire quelque expérience analogue a celle que j'ai indiquée.

"Veuillez m'excuser, Monsieur, de vous déranger à ce sujet et

"Recevez, je vous prie, l'expression de mes sentiments très distingués.

"(Signed) D. PRAIN,
"Director.

"M. le Comte de Follney,
"Biskra."

XXVII.—THE INTRODUCTION OF PARA RUBBER TO BUITENZORG.

The following correspondence on the subject of the date of the introduction of Para rubber to Buitenzorg from the Royal Botanic Gardens, Kew, has recently taken place between the Division for Plant Breeding at Buitenzorg and the Royal Botanic Gardens, Kew:—

"Buitenzorg, 6th March, 1914.

"Sir,—In the books of Mr. Wright on Para rubber and of Mr. Lock on Rubber and Rubber Planting reference is made of different shipments of *Hevea* seeds received at Kew. According to the authors, the first seeds arrived at Kew were probably those brought by Collins from the Amazon in 1873; another parcel was received from Cross in 1877. Mr. Lock remarks: 'Althougb

only a few of Cross's *Hevea* seedlings were preserved, there must be by this time a considerable number of trees growing in Eastern plantations which are directly descended from the survivors of this consignment.' The bulk of our Eastern Heveas descends of course of Wickham's plants, distributed by Kew.

"Studying the variability of our Eastern Heveas, I take much interest in the history of the old introductions. We have in the garden here two trees marked 1875, and received from Kew. It is possible that the date is incorrect, and that it ought to be 1876. Could you perhaps find in your archives in which year Kew sent its first *Hevea* plants to Buitenzorg and to which shipment they belonged, to Cross's, Wickham's or Collins's?

"Could you give me some information about the places where Cross and where Collins gathered their seeds?

"Faithfully yours,

"(Signed) P. J. S. CRAMER,
"Chief of Division for Plant Breeding."

"Royal Botanic Gardens, Kew,
"April 17th, 1914.

"Sir,—In reply to your letter No. 134 V. O. G., dated Buitenzorg, March 6th, 1914, I beg to inform you that in our Outwards Records there is an entry dated August 30th, 1876, which states that 18 *Hevea brasiliensis* plants were included in a Wardian case that day despatched to Dr. Scheffer, Buitenzorg. These 18 plants were raised from 70,000 seeds collected by Mr. Wickham in March, 1876, in the 'Ciringals of the Rio Tapajos,' as stated in a letter from Mr. Wickham to Dr. Hooker, dated March 6th, 1876. They were received at Kew on June 14th, 1876.

"On September 22nd, 1877, another lot of plants was despatched to Dr. Scheffer, and among them were four more plants raised from this lot of *Hevea* seeds received from Mr. Wickham.

"2. It is certain that your Buitenzorg plants, dated 1876, cannot have been raised from seeds collected by Mr. Cross, because the decision on the part of the Secretary of State for India to send Mr. Cross to the Amazon to collect *Hevea* seeds was not arrived at until March, 1876. It was communicated to Dr. Hooker at Kew on April 1st, 1876, and we know from what is said by Sir Clements Markham in his work on Peruvian Bark, pp. 458-460, and from Mr. Cross's own report that Mr. Cross collected his *Hevea* between July and October, 1876, in the neighbourhood of Para and of Marajo Island. I do not find any reference to Mr. Cross having sent or brought to Europe any seeds of *Hevea brasiliensis*. In his report he speaks of collecting plants, not seeds, *e.g.*, on August 7th and August 10th, 1876, he collected, he tells us, about 2000 in all. When he arrived at Liverpool on November 22nd, 1876, he says that there were fully 1000 plants of Para rubber. *Hevea brasiliensis*, in the best condition. He also says that they were deposited at Kew early on the morning of November 23rd (*Cross, Report*, p. 15).

"The entry at Kew, which relates to this transaction, states that there were 1080 seedling plants in Mr. Cross's consignment, that

of these 400 were retained at Kew and 680 (140 with leaves and 540 without) were handed to Mr. William Bull. In a letter to Kew dated May 11th, 1877, Mr. Bull reported that it had not been possible to save more than 14 of the Heveas, although the greatest possible care was taken of them. The result was only in keeping with the expectation formed at Kew when the plants were sent off to Mr. Bull and by Mr. Bull when he received them, 'for they had no fibrous roots but were merely tap-rooted seedlings and nearly dried up.' The result was the same with the 400 kept at Kew, only 3 per cent. of them grew. Whether a single plant brought home by Cross ever became fit to send to Asia I do not know. I cannot find any entry in our archives which could be so interpreted.

"3. I am puzzled over your two trees marked 1875 and received from Kew. It is true that in that year, 1875, Kew received a few seeds from Mr. Wickham on July 7th. He speaks of despatching them in a letter to Dr. Hooker dated April 18th, 1875. It is also true that on August 17th Kew received a few seeds from Mr. Wickham, but there is no indication that any one of these seeds germinated. It is also true that Kew got a quantity of seeds of *Hevea* from the India Office on July 16th, 1875, none of which germinated. Who collected this seed I do not know, but you will find in Dr. King's report of the Royal Botanic Garden, Calcutta, for 1875-6, an account of how he had received in September, 1875, a consignment of 378 seeds from the India Office so badly packed that none of the seed germinated. In a letter from the India Office to Dr. Hooker, dated July 16th, 1875, it is said: 'I am desired by Dr. Forbes Watson to inform you that a bag containing all that remained of these seeds was sent to your address yesterday in the hope that some may germinate, having first found it impossible to have the order for shipment of original cargo countermanded.' It is clear from this that the seed was sent to Calcutta from the India Office without Dr. Hooker being consulted, and that by the time that Dr. Hooker did know of it the consignment had already gone. The balance left over was sown at Kew as soon as it was received. But none of it germinated, so that the lot sent to Dr. King for Calcutta had probably lost its vitality before it was despatched from London. I have no doubt that it was their bad success with this shipment of 1875 that led the India Office to send out Mr. Cross in 1876.

"4. With regard to the statements that have got into various publications concerning seeds collected by Mr. Collins you will perhaps be prepared to find them as inexact as those regarding seeds collected by Mr. Cross.

"Mr. James Collins published in 1872 his Report on Caoutchouc and was much interested in the subject. On June 2nd, 1873, Dr. Hooker had a letter from Mr. Markham to say that Mr. Collins had heard about 2000 seeds of the Para Caoutchouc tree which had just arrived in England, and which he could purchase; further, that Mr. Markham had asked Mr. Collins to purchase them on behalf of the India Office. Mr. Collins on May 31st had, however, already written to Dr. Hooker to tell him that he had that morning received a letter from a Mr. Farris, late of Camela, informing him that in compliance with a request which Mr. Collins

had made to him, he (Mr. Farris) had brought to England some *Hevea* seeds which were quite fresh. There were several hundreds of these seeds collected by Mr. Farris, but when they were received at Kew and sown there, of the whole only about a dozen germinated. On September 22nd, 1873, six of the plants raised from the seeds collected by Mr. Farris and obtained from him through Mr. Collins for the India Office, were taken in a Wardian case to Calcutta by Dr. King. All of the other plants raised from these Farris-Collins seeds of 1873 were kept at Kew. It is to be seen from the Report of the Royal Botanic Garden, Calcutta, for 1873-4, that the propagation of *Hevea* from cuttings taken from the six plants taken out to India by Dr. King was at once started, and from the Royal Botanic Gardens, Kew, Report for 1875, p. 7, it is seen that at Kew it was found possible to do the same thing. But the *Hevea* did not succeed in Northern India, and I do not believe that any plants propagated by cuttings from the Farris (so-called Collins) plants ever reached Malaya from Calcutta. Nor was it necessary to continue this method of propagation anywhere after the fortunate arrival of Mr. Wickham's good seeds in 1876, so that I do not believe that any *Hevea* propagated from the Farris plants were sent to the East from Kew.

"Yours faithfully,
"(Signed) D. PRAIN,
"Director.

"Dr. P. J. S. Cramer,
"Chief of Division for Plant Breeding,
"Department van Landbouw,
"Buitenzorg, Java."

XXVIII.—HEDYCHIUM CORONARIUM FROM CALCUTTA.

In *Kew Bulletin*, 1912, p. 373, a detailed account appeared of investigations made by Messrs. Clayton Beadle & Stevens into the possibilities of *Hedychium coronarium* as a source of material for paper-making. The experiments were made with dried material from Brazil and with fresh stems grown in the Royal Botanic Gardens, Kew. Subsequently a supply of the dried plant received from the Royal Botanic Garden, Sibpur, Calcutta, was forwarded to Messrs. Clayton Beadle & Stevens, who have examined the same to see if the plant would give similar results from different parts of the world.

The following report has been furnished by Messrs. Clayton Beadle & Stevens:—"The botanical specimens sent over from Calcutta are complete, dried-down specimens, whereas the *Hedychium coronarium* examined from Brazil was in the form of crushed fibre produced by passing the green, freshly cut stems through sugar rollers to express the juices, prior to drying for shipment. This in itself constitutes an important difference. We had our doubts whether complete specimens in the dried-down condition could be rendered serviceable in the manufacture of paper

because the complete specimens from Brazil had undergone fermentation. In the condition as sent from Brazil, however, we believe that they were packed in a green state, whereas those sent from Calcutta were presumably carefully dried before packing. We have recently cut down a green *Hedychium* stem and passed it through crushing rollers, and we find that of the dry weight in the complete green stem there is 23 per cent. of organic matter contained in the juices and 77 per cent. of dry crushed material. These juices are of an acid nature and have a powerful reducing action upon Fehling solution, and it is to the presence of these juices in the green stems as sent from Brazil that we attribute its destruction in transit. The dried-down specimens from Calcutta do not appear to have suffered from any putrefactive changes, due —we presume—to the fact that they were completely dried before packing.

"The Calcutta specimens were boiled with 10 per cent. (of 77 per cent.) caustic soda for four hours at $2\frac{1}{2}$ atmospheres, washed free of liquor and lightly brushed for three hours in a hollander, then made into paper without any added sizing material.

The soda consumed on the raw material ... = 6·0%
,, ,, on paper ... ... = 18·0%
The yield of unbleached paper on raw material = 32·5%

This on a basis of 77 per cent. crushed fibre would yield 43 per cent. of paper on the weight of the crushed fibre. Brazilian crushed fibre yields under similar circumstances 50 per cent. unbleached paper. The sheets of paper produced from the Calcutta fibre were examined in different thicknesses and substances, and yielded the following figures for bursting strain :—

Thickness in mm.	Substance grms. per sq. m.	lb. Demy.	Bursting strain in lbs. per sq. in.
·10	80	21	26
·13	110	30	53
·14	115	31	55
·28	230	62	105

These figures are satisfactory. The material boils down readily, it is easily beaten to the condition of pulp, requiring comparatively little power; it drains well and felts well when made into paper, and has a good wet strength after couching, and there should be no difficulty in manipulating it upon the paper machine.

"The 'Waterleaf' is not ink-proof as that produced from the Brazilian fibre is, but this is probably due to the fact that whole specimens sent home dried down contain juices which probably had some effect upon those natural constituents (pith cells) which give to the *Hedychium* fibre these peculiar self-sizing qualities.

"We think this statement is probably true, because *Hedychium* green stems from Kew, Paris, and elsewhere, have shown self-sizing qualities if crushed to remove the juices and immediately used, or if the crushed material had been dried down for shipment after the removal of the juices. The above paper is of a good kraft colour with a strong tear and a rattle and should be very serviceable for ordinary wrapping papers. It is elastic. has a good breaking strain and bursting strain and possesses good folding and wearing qualities. We are disposed to conclude that *Hedychium*

coronarium will yield good paper-making qualities from whatever part of the world it is gathered, and that any differences in the qualities of the above-mentioned material from Calcutta as compared with that from Brazil (which latter we have thoroughly investigated) are to be attributed to differences in the preparation of the raw fibre prior to shipment rather than to any difference in the growth of the plant itself."

XXIX.—DIAGNOSES AFRICANAE: LIX.

1501. **Crassula clavata,** *N. E. Brown* [Crassulaceae]; species ab omnibus distinctissima foliis rhomboideo-clavatis, floribus capitatis, petalis apice dorso appendiculis oblongo-ovoideis carnosis instructis.

Herba nana, succulenta, acaulis. *Folia* omnia radicalia, opposita, in rosulam 3–4 cm. diametro dense conferta, 1–2 cm. longa, 6–9 mm. lata, 5–8 mm. prope apicem crassa, rhomboideo-clavata, obtusa, supra plana, apice oblique subtruncata, subtus valde convexa, glabra, viridia, leviter glauca, punctata. *Pedunculi* 3 cm. longi, 1·5 mm. crassi, erecti, minute puberuli, rubri, prope apicem bracteis duabus oppositis deltoideis 2–3 mm. longis instructi. *Flores* sessiles, in capitulum 1·3 cm. diametro dispositi. *Bracteae* 2–2·5 mm. longae, lineares, obtusae, glabrae, ciliatae. *Sepala* 1·75–2 mm. longa, linearia, obtusa, ciliata. *Petala* 5–6, erecto-conniventia, fere 3 mm. longa, basi connata, superne spathulata, lamina rhomboideo-ovata, subacuta, dorso infra apicem appendiculo carnoso ovoideo-oblongo erecto instructa, alba. *Stamina* 5–6, corollae tubo inserta. *Glandulae hypogynae* minutae, clavatae, pulchre aurantiacae. *Carpella* 5–6; styli brevissimi.

South Africa. Prince Albert Division: without precise locality, *Pearson*.

Described from a living plant sent to Kew by Prof. Pearson in 1912.

1502. **Mesembryanthemum fulviceps,** *N. E. Brown* [Ficoideae-Mesembryeae]; affine *M. Lesliei*, N. E. Br., sed fissura inter folia multo profundiore et apicibus foliorum fulvis maculis parvis rotundatis atroviridibus notatis bene distinguitur.

Herba succulenta, perparva, acaulis. *Folia* 2, in corpusculum ultra medium connata. *Corpuscula* subsolitaria vel subcaespitosa, 2·5–4·5 cm. longa, obconica, apice 2·5–2·8 cm. lata, truncata, fissuris transversis notata, laevia, glabra, fulva, maculis parvis rotundatis sordide atroviridibus notata, lateribus leviter purpureo-cinerascentibus opacis; fissura 7–8 mm. profunda. *Flores* ignoti.

South Africa. Great Namaqualand: Great Karasberg Region, *Pearson*.

This plant was collected by Professor H. H. W. Pearson during the Percy Sladen Memorial Expedition to the Great Karasberg Range, and sent to Kew in the Spring of 1913. As, from a want of sunshine, these plants do not flower freely in this country, and as this species may possibly die out of cultivation without flowering, I have deemed it better to publish a description of it. In size

and form it is much like *M. Lesliei*, N. E. Br., but the much deeper fissure separating the tips of the leaves and the peculiar tawny colour of their truncate tips, marked with small round dull dark green dots, readily distinguishes it from that species, which also comes from a far distant locality in the Transvaal.

1503. Ceropegia abinsica, *N. E. Brown* [Asclepiadaceae-Ceropegieae]; affinis *C. campanulatae*, Don, sed foliis latioribus, corollae tubo extra sparse piloso-pubescente immaculato et lobis duplo angustioribus intra glabris facile distinguitur.

Herba perennis, erecta, tuberosa. *Tuber* discoideum 2–3 cm. diametro. *Caulis* erectus, simplex vel ramosus, 9–50 cm. altus, 2 mm. crassus, puberulus. *Folia* patula vel subhorizontalia, subsessilia vel brevissime petiolata, 6–12 cm. longa, 2·5–6 mm. lata, linearia, acuta, basi rotundata vel subcordata, supra glabra, subtus costa marginibusque scabra. *Flores* pauci, solitarii, ad nodos laterales vel terminales, erecti vel adscendentes. *Pedunculi* 1–2 cm. longi, breviter pubescentes. *Sepala* 4 mm. longa, attenuato-subulata, minute puberula. *Corollae* tubus rectus 2·5–3·2 cm. longus, basi inflatus, medio cylindricus, apice infundibuliformis et 0·9–1·1 cm. diametro, extra breviter et tenuiter piloso-pubescens, intra glaber, virescens, immaculatus; lobi 2·5–3·5 cm. longi, 0·5 mm. lati, erecti (vel contorti ?), apice connati, e basi deltoideo anguste lineares, replicati, marginibus ciliatis, intra glabri. *Corona exterior* 10-dentata; dentes 1 mm. longae, subulatae, apice barbatae, atro-purpureae. *Coronae interioris* lobi 2 mm. longi, connivento-erecti, apice leviter recurvi, lineares, apice leviter dilatati, glabri.

Tropical Africa. Northern Nigeria: not uncommon in the bush at Abinsi, July 21st, 1912, *Dalziel* 690.

Metaporana, *N. E. Brown* [Convolvulaceae-Convolvuleae]; genus novum affine *Poranae*, Burm., sed calycis lobis immutatis, corollae lobis patentissimis et capsula e calyce longe exserta differt.

Sepala aequalia, fructu immutata. *Corolla* ultra medium 5-loba; tubus subcylindricus calyce aequilongus; lobi induplicato-valvati, patentissimi. *Stamina* 5, exserta, tubo corollae affixa; filamenta filiformia; antherae elliptico-oblongae, dorsifixae. *Ovarium* 2-loculare; loculi 2-ovulati; styli 2 vel stylus fere ad basin bipartitus; stigmata capitata. *Capsula* parva, subgloboso-ovoidea, apice conica, e calyce longe exserta, 4-valvis, 2–4-sperma. *Semina* subangulato-ellipsoidea, glabra.—*Frutices* volubiles. *Folia* alterna, ovata vel oblonga. *Flores* parvi, in cymas vel paniculas axillares vel terminales dispositi.

Of the two species belonging to this genus, one is new and the other has been placed in the genus *Porana*, from which the unchanged calyx and much exerted capsule at once distinguish it. The habit of the plants and texture of the calyx and corolla are also different from that of *Porana*. Both are evidently nearly related, but may be readily distinguished by the following characters:—

Leaves ovate, acute, acuminate or obtuse, with petioles 0·5–2 cm. long; styles 2, with very large stigmas	*M. densiflora*

Leaves oblong, obtusely rounded or emarginate at the apex, with petioles 1·5–3 mm. long; style divided nearly to the base, with very small stigmas ... ... *M. angolensis*

1504. **Metaporana densiflora,** *N. E. Brown.—Porana densiflora*, Hallier f. in Engler Bot. Jahrb. vol. xviii, p. 93; Baker and Rendle in Fl. Trop. Afr. vol. iv, sect. 2, p. 85.

Tropical Africa. Uganda: on plains below Butaiba, Lake Albert, *Dawe* 816; Busoga, *Brown* 369. British East Africa: between Mombasa and Witu, *Whyte;* between Mombasa and Takaunga, *Whyte*. German East Africa: Usambara; Buiti, *Holst* 2379; Duga, *Holst* 3205.

1505. **Metaporana angolensis,** *N. E. Brown. Frutex* scandens. *Rami* graciles, minute adpresse puberuli. *Folia* alterna, subglabra vel tenuissime adpresse puberula; petiolus 1·5–3 mm. longus; lamina 1–4 cm. longa, 0·4–1·5 cm. lata, oblonga, apice obtusissima vel emarginata, basi rotundata, subcordata vel subtruncata. *Cymae* vel *paniculae* axillares vel terminales, pedunculatae, pluriflorae. *Pedunculi* 0·3–1·8 cm. longi, graciles, subglabri vel minute adpresse puberuli. *Bracteae* minutae, 1–1·5 mm. longae, lanceolatae, adpresse puberulae. *Pedicelli* 2–3 mm. longi. *Sepala* 2 mm. longa, 1·5–2 mm. lata, elliptica, apice obtuse rotundata, subcoriacea, subglabra vel sparse adpresse puberula. *Corolla* 7 mm. diametro, alba; tubus 2 mm. longus, subcylindricus; lobi 3 mm. longi, 2–2·5 mm. lati, elliptici, obtusi, patentissimi, dorso vitta lata adpresse puberula instructi. *Stamina* exserta; filamenta 2 mm. longa; antherae 1 mm. longae. *Ovarium* ellipsoideum, apice penicillato-pilosum; stylus fere ad basin bipartitus, 4–4·5 mm. longus, glaber; stigmate minuta, capitata. *Capsula* subglobosa, apice conica, 3·5–4 mm. longa et lata, e calyce longe exserta, glabra. *Semina* 2–2·5 mm. longa, minutissime punctata, fusca.

Tropical Africa. Angola: near the Mossamedes Railway at between km. 106·5 and 108·5, *Pearson* 2388, 2391, 2813, 2903.

1506. **Acrocephalus triramosus,** *N. E. Brown* [Labiatae-Ocimoideae]; affinis *A. succisaefoliae*, Baker, sed caulibus deflexo-pilosis et bracteis infra capitulas magnis foliiformibus conspicue differt.

Herba 20–30 cm. alta, forsan tuberosa, caulibus tribus. *Caules* (vel internodia) 15–16 cm. longae, triramosae, ramis 3–10 cm. longis tricapitatis, deflexo-pilosae. *Folia* pauca, subsessilia, 6–15 cm. longa, 0·7–2·2 cm. lata, anguste oblonga vel anguste lanceolato-oblonga, acuta, basi cuneata, subintegra vel obscure dentata, utrinque sparse pubescentia. *Capituli* pedunculis 0·3–1·8 cm. longis deflexo-pilosis suffulti. *Bracteae* infra capitulas foliis similes, 2–6 cm. longae, 0·4–2 cm. latae; bracteae florentes 5–7 mm. longae, 4–6 mm. latae, late ovatae, abrupte acuminatae. *Calyx* 1·75 (fructu 4–5) mm. longus, bilabiatus, adpresse pilosus, labiis integris rotundatis. *Corolla* 5 mm. longa, coerulea; tubus rectus, glaber; labium superum 3-lobum, 2 mm. longum, lobo intermedio breviter bifido dorso piloso; labium

inferum vix 2 mm. longum, oblongum, obtusum, concavum. *Stamina* vix exserta.

Tropical Africa. Angola: on the high plateau near Humpata, 1850 m., *Pearson* 2664.

1507. **Aeolanthus lobatus,** *N. E. Brown* [Labiatae-Ocimoideae]; affinis *A. pinnatifido*, Hochst, sed spicis longioribus et laxioribus, floribus minoribus et bracteis aristato-acuminatis bene distinguitur.

Herba circa 30 cm. alta, ramosa, ramis adscendentibus minutissime puberulis. *Folia* opposita, petiolata, pinnatisecta, 1·5–4 cm. longa, 0·6–2 cm. lata, subglabra, lobis linearibus vel lineari-spathulatis obtusis. *Paniculae* terminales; rami 2·5–10 cm. longi, erecti, secundiflori. *Flores* sessiles. *Bracteae* 3–5 mm. longae, lanceolatae vel ovato-lanceolatae, longe aristato-acuminatae, minute glanduloso-puberulae. *Calyx* 1·5 mm. longus, campanulatus, truncatus, obscure 5–crenatus, minutissime glanduloso-puberulus, fructu clausus. *Corolla* glabra, alba, labio infero apice purpureo; tubus 3·5–4 mm. longus, rectus, apice dilatatus, compressus; labium superum erectum, truncato-bilobum, lobis 2 mm. longis deltoideo-lanceolatis acutis horizontaliter divergentibus; labium inferum 6–7 mm. longum, rectum, compresso-concavum, obtusum. *Stamina* 4, apice incurva, 4–5 mm. longa, 2 inferiora basi connata, 2 superiora libera. *Stylus* staminibus longior, apice bifidus. *Nucleae* compressae, suborbiculares, laeves, nitidae.

Tropical Africa. Angola: open ground near the Mossamedes railway at km. 107, *Pearson* 2643.

1508. **Anthericum acutum,** *C. H. Wright* [Liliaceae-Asphodeleae]; species *A. pachyphyllo*, Baker, affinis, foliis longe et anguste acuminatis, bracteisque longe cuspidatis differt.

Folia lineari-lanceolata, longe angusteque acuminata, basi vaginantia, minute scabridula, minutissime serrulata, 34 cm. longa, 1 cm. lata. *Pedunculus* cylindricus, circa 45 cm. longus, paucibracteatus; racemus 20 cm. longus; bracteae e basi ovata longe cuspidatae, infimae 2·5 cm. longae, superiores gradatim minores. *Perianthium* album; segmenta oblonga, 17 mm. longa, 5 mm. lata, costa 1 mm. lata viridi trinervia instructa, exteriora apice callosa. *Filamenta* complanata, 6 mm. longa; antherae 4 mm. longae, loculis basi divergentibus. *Ovarium* oblongum, trilobum; stylus staminibus superans, sursum gradatim incrassatus.

South Africa. Natal: Ensikeni, 1220 m., *W. J. Haygarth in Herb. Wood*, 12,063.

1509. **Fuirena cristata,** Turrill [Cyperaceae-Scirpoideae]; affinis *F. cinerascenti*, Ridley, sed foliis brevioribus, petalis majoribus apice cristatis mucronatis praecipue differt.

Rhizoma horizontale, crassum, usque ad 8 mm. diametro. *Culmi* erecti, usque ad 2·5 cm. longi, teretes, sulcati, basi vaginis bifidis obtecti, superne patenter hirsuti, inferne leviter pubescentes vel glabri. *Folia* ovato-lanceolata, lanceolata vel lineari-lanceolata, apice acuta, usque ad 4 cm. longa et 7 mm. lata, nervis parallelis

numerosis pagina utraque subprominentibus, plus minusve hirsuta, vaginis integris hirsutis. *Spiculae* 7–8, aggregatae, ellipsoideo-cylindricae, usque ad 7 mm. longae et 2·75 mm. latae, multiflorae. *Glumae* obovatae, 3·5 mm. longae (mucro 1·5 mm. longo plus minusve recurvo excluso), 2 mm. latae, extra hirsutae, intus glabrae, trinerviae. *Sepala* 3, minima, setosa, 0·5 mm. longa. *Petala* 3, ovata, stipitata, apice cristata, in flore maturo crista late biloba circiter 0·5 mm. longa 0·6 mm. lata mucronata ciliata inclusa 2 mm. longa, 1 mm. lata, trinervia, ciliata. *Stamina* 3, filamentis gracilibus 1 mm. longis, antheris linearibus 1·25 mm. longis. *Ovarium* trigono-ellipsoideum, stipitatum, 0·75 mm. longum, 0·4 mm. latum, album, glabrum. *Stylus* cum ramis tribus 3 mm. longus. *Nux* ovata, stipitata, acute trigona, apice acuminata, stipite 0·5 mm. longo incluso 1·75 mm. longa, glabra, pallide straminea.—*F. calolepis*, K. Schum. in Baum, Kunene-Sambesi Expedition 179, non in Abh. Preuss. Akad. Wiss. (1894) 20 et 21 nec in Engl. Pflanzenw. Ost-Afr. C (1895) 126.

Tropical Africa. Kunene-Sambesi Expedition: Habungu, 1150 m., *H. Baum* 472. Benguella, country of the Ganguellas and Ambuellas, *Gossweiler* 2204, 2166.

1510. **Mariscus laxiflorus,** *Turrill* [Cyperaceae-Scirpoideae]; affinis *M. leptophyllo*, C. B. Clarke, sed culmis foliorum vaginis membranaceis inferne ad partem dimidiam tertiamve haud vestitis, inflorescentiae radiis longioribus differt.

Rhizoma horizontale, breve. *Culmi* erecti, usque ad 4·5 dm. alti, 1–1·25 mm. diametro, indistincte triangulares, glabri, ima basi incrassati, foliorum vaginis membranaceis haud conspicue obtecti. *Folia* linearia, apice acuta usque ad 1·3 dm. longa et 2·5 mm. lata, tenuiter serrata, glabra; vagina integra, glabra. *Inflorescentia* umbellata, radiis usque ad 8 cm. longis; bracteae foliis similes usque ad 1·2 dm. longae. *Spiculae* late lineares, 6–9 mm. longae, 2·5 mm. latae, 3–6-florae. *Glumae* vacuae ad spiculae basem duae, inferiore plus minusve anguste lineari, superiore ovata; glumae fertiles 3–6, late ovatae, apice obtusae, 3 mm. longae, 2·5 mm. latae, glabrae, nervis lateralibus circiter 8 conspicuis. *Stamina* 3, filamentis gracilibus 1·3 mm. longis, antheris linearibus 0·75 mm. longis. *Stylus* cum ramis tribus 3·25 mm. longus, basi persistente leviter incrassatus. *Nux* oblongo-ellipsoidea, acute trigona, circiter 2·25 mm. alta, 1·25 mm. diametro, brunnea.

Tropical Africa. Angola: Benguella, country of the Ganguellas and Ambuellas, *Gossweiler* 3723.

XXX.—MISCELLANEOUS NOTES.

Mr. Arthur William Maynard, a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed, on the recommendation of Kew, Gardener at the National Botanic Gardens, Kirstenbosch, Cape Town, South Africa.

Mr. Robert Service, a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed on the recom-

mendation of Kew, Horticultural Superintendent in the Department of Science and Agriculture in the Colony of British Guiana.

Miss J. J. Clark.—Kew has sustained a great loss through the untimely death of Miss J. J. Clark, of the Herbarium staff, which occurred on February 2nd, 1914, after a long illness.

Miss Clark, who was born on August 25th, 1881, was educated at Southend High School, and afterwards for four years at University College, Aberystwith, where she gained the B.Sc. degree of London University with first-class honours. After leaving college, she held the post of science mistress at her old school, and subsequently accepted a post as private secretary to a man of letters.

In November, 1909, she was appointed by the Board of Agriculture and Fisheries a Lady Assistant in the Herbarium at Kew after limited competition. During the short time she was a member of the Kew staff Miss Clark proved herself a careful and trustworthy worker, and took an unfailing interest in both the official and social life of the Gardens. In the "Annals of Botany," vol. xxvi. 1912, p. 948, she published an interesting note on "Abnormal Flowers of Amelanchier spicata." Other publications were diagnoses of new species, chiefly from Tropical Africa (*Kew Bull.* 1911, pp. 229, 263; 1913, pp. 76-77), and descriptions of plants figured in the *Botanical Magazine* (vols. 138, 139, 1912-13).

Although it was known that Miss Clark was very seriously ill, her untimely end at the early age of 32 came as a shock to her colleagues, and she leaves them with a keen sense of the loss of a helpful and cheery personality. To those who knew her best her patience and courage under the trials of failing health will always be a reverent memory.

E. M. W.

Dr. Jacques Huber.—It is with great regret that we have to record the sudden death of Dr. Jacques Huber, Director of the Museum Goeldi, Para, on February 18th, in that city. He went to Para in the year 1895, and was made Director of the Botanical Section of the newly-reorganised State Museum of Natural Science and Ethnography (now Museu Goeldi). Here he laid out the botanic garden and undertook numerous scientific journeys into different parts of Brazil, the results of which added considerably to our knowledge of the Brazilian flora. In addition to his general botanical and geographical studies he had an extensive knowledge of Para rubber and its cultivation, and many of his articles on *Hevea* and other rubber plants were published in the Bulletin of the Herbier Boissier. In March, 1907, when Dr. Goeldi returned to Europe, Dr. Huber was appointed Director of the Goeldi Museum.

The Lawrence Orchid Collection.—It is well known that the orchid collection of the late Sir Trevor Lawrence, Bart., K.C.V.O., Burford Lodge, Dorking, was very rich in rare and interesting species, Sir Trevor having paid special attention to them for a

great many years. He had an eye for anything that was quaint or interesting in structure, quite independent of its decorative value, the result being that the collection was not only thoroughly representative of the usual showy species and hybrids, but also possessed examples of most of the cultivated genera, some of which are seldom met with, and there were plants from almost every quarter of the globe, and possessing the most diverse cultural requirements. At his death the whole of the plants were bequeathed to his wife, with the desire that she would present to the Royal Botanic Gardens, Kew, such portions of the collection as she might be advised or might consider to be primarily of botanical interest, the matter being left entirely to her decision. Some time ago Lady Lawrence wrote to the Director informing him of her pleasure in carrying out Sir Trevor's wishes, and a large selection, consisting of about 580 plants, belonging to upwards of eighty genera, has now been received. The gift forms a very valuable addition to the Kew collection, and is rich in such genera as *Bulbophyllum*, *Cirrhopetalum*, *Pleurothallis*, *Maxillaria*, *Epidendrum*, *Eria*, *Angraecum*, *Dendrobium* and *Coelogyne*, and there are many species not previously represented at Kew, and some that are very rarely seen in cultivation. The genera not previously represented in the collection include *Trichoceros*, a high Andine genus very difficult to get home alive and very difficult to cultivate afterwards, *Nasonia* and *Quekettia*, two small American genera, and *Stereochilus* and *Sigmatogyne* from North India. The collection also includes a number of undetermined species which have not yet flowered, and of which the genus is in a few cases still doubtful. These have been obtained from various sources, a few of them having been sent from West Africa by Sir Trevor's son, Captain C. T. Lawrence. In many cases the source is indicated on the labels, and it is hoped to determine them as they flower.

The Crossland Collection of Fungi.—A valuable addition to the already extensive mycological collection in the herbarium has been made through the purchase of the series of drawings and specimens of British fungi belonging to Mr. C. Crossland, of Halifax. The drawings, representing 543 species, mostly Discomycetes, are especially welcome. There is a coloured representation of each species, natural size, accompanied by sections, dissections and spore measurements; also a detailed description, critical notes, etc., and in each instance by the specimens from which the figures and descriptions were drawn.

The general collection of fungi, numbering 2000 species, is in an excellent state of preservation, and embraces representatives of every group of British fungi. There are also some 84 myxomycetes.

The large Tulip Tree at Kew.—On Monday, March 16th, the fine old Tulip Tree which stood at the north end of the Rhododendron Dell was uprooted by the great gale of that day. The tree first began to show evidences of declining vigour about twenty

years ago, and latterly its roots have been attacked by a fungoid parasite. This, together with the softening of the earth due to the excessive rainfall in early March, reduced its hold of the ground so much that when the storm reached its climax about 11.15 a.m., it fell with a crash, its great limbs snapping like carrots. Its loss is a great one for Kew, for although not the largest, it was one of the largest, trees in the British Isles, and, from the position it occupied, the most famous. Its measurements, taken as it lay on the ground, were: height, 80 feet; spread of branches, 64 feet; girth of trunk at 5 feet from base, 10 feet. At 15 feet from the ground, just below the first branches, the trunk girthed 15 feet 3 inches. Its age, computed from the annual rings, was about 150 years. It was, therefore, planted in the early years of the reign of George III. It grew, of course, on what were the Richmond Gardens, made so famous by Queen Caroline, queen of George II., and it was evidently planted during the many alterations made by her grandson and Capability Brown (including the formation of the Hollow Walk or Rhododendron Dell) soon after his accession in 1760. There is a good engraving of the tree in the Gardeners' Chronicle of August 23rd, 1890, p. 219. Two good-sized Tulip trees and several smaller ones remain in Kew. One of the former stands in the Azalea Garden, the other in the garden of Cambridge Cottage.

Botanical Magazine for May.—The plants figured are *Abies magnifica*, A. Murray (t. 8552); *Zephyranthes cardinalis*, C. H. Wright (t. 8553); *Mazus reptans*, N. E. Brown (t. 8554); *Lonicera Ledebourii*, Eschscholtz (t. 8555), and *Pithecoctenium cynanchoides*, DC. (t. 8556).

The *Abies* is a handsome species from the north-western United States, where it is a dominant tree in the forest belt of the Sierra Nevada, between 6000 and 9000 feet above sea level, extending northwards into the Cascade Mountains in Oregon. It was first introduced into the British Islands in 1851, and now some fine specimens are met with, especially in Scotland. The figure was prepared from material supplied by Mr. H. Clinton Baker, in whose fine pinetum at Bayfordbury there is a tree over sixty feet high, with a trunk about six feet in girth. From *A. nobilis*, Lindl., with which it has been very much confused, it may be distinguished by the leaves, which are keeled on both surfaces, whereas in *A. nobilis* they are grooved on the upper surface.

Zephyranthes cardinalis is an ornamental new species allied to *Z. concolor* Benth. and Hook. f., differing from it in the shorter pedicels, shorter narrowly tubular spathe, and bright red perianth. It is not known in what part of America the plant is indigenous. A bulb reached Kew through Mr. J. G. Baker, who received it from Mr. E. S. Miller, of Wading River, New York. Mr. Miller obtained the plant from the Bahama Islands, where it is grown in gardens.

The *Mazus*, a new species from the Himalaya, has been confused with *M. rugosus*, Lour., under which name it appeared in cultivation last year. Its introduction is due to Mr. B. Crisp, of the

Wargrave Plant Farm, Limited, who presented to Kew the plant from which the figure was prepared. It is a small perennial herb with prostrate stems, opposite more or less lanceolate toothed leaves, and few-flowered racemes. The unequally 2-lipped corolla is purplish-blue, the lower lip blotched with white, yellow, and red-purple. It has some resemblance to the smaller Lobelias.

Lonicera Ledebourii is a Californian species which has been in cultivation in the British Islands since 1838, and being an easily grown attractive plant it is now widely spread in gardens. It resembles, especially in the involucres, the well-known *L. involucrata*, Banks, which, however, may be easily distinguished from it by its thinner glabrous or nearly glabrous leaves and longer stamens.

The genus *Pithecoctenium* is one of the best characterised members of the *Bignoniaceae*, easily recognised by the capsule, which is variously muricate or tuberculate outside, and is terminated by a capitate appendage of the septum. *P. cynanchoides* is an attractive climbing shrub having a rather wide distribution in Eastern South America, where it is known from the neighbourhood of Rio de Janeiro in Brazil, from Paraguay, Uruguay, and the north-west of the Argentine Republic. It has been grown at Kew since 1884, when seeds were presented by Dr. Dormer, but flowers were not produced till 1895. The corolla is tubular funnel-shaped, $1\frac{3}{4}$-2 inches long, white, with the inside of the tube yellow.

Asiatic species of Sageretia.—A useful revision of the Asiatic species of *Sageretia* is contributed by C. K. Schneider to Sargent's Plantae Wilsonianae, part 4, pp. 226-231, published March 24, 1914. Schneider has inadvertently re-described under new names two Chinese species published in *Kew Bulletin*, 1908, pp. 14-15. *Sageretia apiculata*, C. K. Schneider, l.c. 231, is a synonym of *S. gracilis*, J. R. Drumm. et Sprague (founded on the same numbers of Henry); and *S. Cavaleriei*, C. K. Schneider, l.c. 228, is synonymous with *S. Henryi*, J. R. Drumm. et Sprague, according to specimens (Henry, 7118 and 11240) referred by Schneider to his *S. Cavaleriei*.

J. R. D. and T. A. S.

Hedychium coronarium in British Guiana.—The following extract is taken from a letter received from the Director, Science and Agriculture Department, Georgetown, British Guiana, to Director, Royal Botanic Gardens, Kew, dated March 13th, 1914, and is of interest in showing the successful results which have been obtained from the experimental planting of *Hedychium coronarium* in British Guiana:—

"The first planting of *Hedychium coronarium* has produced 28 tons of stalk and leaves per acre as a five months' crop on dry land. On irrigated land (rice) the first trials have failed. On the tidal parts of the rivers above the brackish water sections the *Hedychium* grows on swampy land submerged twice in every twenty-four hours with great vigour, the stems attaining a length of 6 feet 6 inches as compared with from 2 feet 6 inches to 3 feet on dry soil."

A Beech Disease.—In a report on the Beech Coccus published in the *Kew Bulletin** in 1911, reference was made to a disease of the beech, which renders the trunk liable to break off at a height of from 15 to 20 feet from the ground. In trees affected in this way, the weakness of the stem in the region referred to is due to a fungal disease of the wood, which proves to be partially decayed for some distance above and below the fracture. The fructifications of two fungi were specially noted in the same region of diseased trees which had broken in this way. These were *Nectria ditissima*, Tul. and *Polyporus adustus*, Fr., and the disease was provisionally attributed to the *Nectria*.

A paper† has recently been published giving the results of some observations and experiments in connection with this disease. The conclusion arrived at in the paper is that the disease is probably caused by *Polyporus adustus*.

Spore infections have not yet been made, but infection of the wood was obtained by inserting mycelium in artificial wounds reaching the sap-wood. The fungus is thus shown to be capable of growing as a wound-parasite.‡

Various cultures were made from mycelium from the diseased wood of trees showing the characteristic fracture, and the cultures were found to be similar to those obtained from pure *Polyporus adustus*. A study was also made of the enzymes in mycelium grown from diseased wood. Diastase, invertase, tyrosinase and emulsin were found, but curiously enough the presence of cytase could not be determined experimentally.

Fructifications of *Polyporus adustus*, apparently mature, on beech were examined, but basidiospores were not found in them, though some of these spores were seen in young encrusting fructifications.

The curious phenomenon of the snapping of the trunk at a fairly uniform height is discussed, and one of the possible explanations suggested is as follows.§ Given the tapering form of the trunk, the strain on the latter, due to the action of wind on the crown, might cause incomplete rupture in the form of a crack at a definite height, and this might lead to infection at the same height, *i.e.*, through the crack.

As the disease is rather a serious one, it is desirable that further investigations should be made, including experimental work on spore-infection, and a study of any data which may throw light on the mode and causes of infection.

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* Boodle and Dallimore, Report on Investigations made regarding "Beech Coccus." *Kew Bull.* 1911, p. 332.

† Elsie M. Prior, Contributions to a knowledge of "the Snap-Beech" Disease. Journ. Econ. Biology, vol. viii. (1913), pp. 249-263, with two plates.

‡ It had previously been suspected of having parasitic tendencies (Massee, Diseases of Cultivated Plants and Trees, p. 387).

§ The suggestion made by Boodle and Dallimore (loc. cit. p. 343) was that sunburn after thinning of the trees might be the injury responsible for the entry of the fungus concerned.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5] [1914

XXXI.—NEW FAGACEAE FROM THE MALAY PENINSULA.

J. S. Gamble.

1. Pasania Kingiana, *Gamble* [Fagaceae]; species monticola distincta, *P. lappaceae*, Oerst., quoad faciem glandis cupulae affinis, sed foliis percoriaceis, floribus solitariis, ♀ longe stylosis insignis.

Arbor, ramulis crassis nodosis nigro-brunneis. *Folia* percoriacea, glabra, ovata, apice obtuse acuta, basi rotundata, 6–12 cm. longa, 3–6 cm. lata, supra lucida, infra prominenter reticulata, margine recurva, costa crassa; nervi utrinque 6–8, ad marginem curvati; nervuli transversi irregulares; petiolus crassus, circa 4 mm. longus. *Spicae* 10–12 cm. longae, ♂, ♀ et androgynae mixtae, e foliorum ultimorum axillis; rhachis crassa, angulosa, puberula. *Flores* solitarii, in spicis androgynis inferiores ♀, tum pauci ♂♀, deinde supremi ♂, omnes bracteolis lanceolatis 2 mm. longis et squamarum pulvinis muniti; perianthium ♂ 2 mm. longum, in lobos 6 acutos 1 mm. longos divisum, ♀ paullo minus; stamina 12 vel pauciora, filamentis gracilibus, in ♂♀ brevibus; pistillodium in ♂ conspicuum, villosum; styli in ♀ 3, cylindrici, 2·5 mm. longi. *Cupula* cyathiformis, 2–2·5 cm. longa, squamis patentibus puberulis 3 mm. longis instructa, pedicello 6 mm. longo, margine recurva, prope basin squamae ovatae, magnae, saepe 5 mm. longae, supra gradatim minores; glans ovoideo-globosa, basi complanata, velutina, 2–2·7 cm. diametro et 1·5–2 cm. alta, umbone crasso.

Malay Peninsula. Perak: on Gunong Bubu and Gunong Inas, 1300–1500 m., *Wray* 3910, 4155. Pahang: Gunong Brumber, 2100 m., *Wray* 1586.

2. **Pasania lampadaria,** *Gamble* [Fagaceae]; species distincta sectionis *Cyclobalanus*, foliis magnis percoriaceis et cupulis tribus connatis insignis.

Arbor parva, ramulis crassissimis, cortice laevi griseo vel fere nigro lenticellis rotundatis ornato. *Folia* percoriacea, lanceolata, apice acuminata, acumine obliquo obtuso, basi attenuata et plus

minusve in petiolum attenuata, 20–25 cm. longa, 6–10 cm. lata, supra laevia, lucida, infra pallida, pubescentia minuta adpressa instructa, marginibus integris recurvis; costa crassissima, prominens; nervi utrinque 12–14, primum fere recti, deinde arcuati; reticulatio obscura; petiolus crassissimus, rugosus, 1–1·5 cm. longus. *Flores* ignoti. *Fructus* (immaturi) sessiles, in spicis crassis circa 10 cm. longis, generaliter per tres connati, aliquando plures, aliquando solitarii vel bini; cupulae glandem includentes, utriusque glandis lamellis circa 5 minute denticulatis; glandes albo-sericeae; umbo prominens, conoideus.

Malay Peninsula. Perak: in mountain regions 1000–1500 m., Gunong Batu Puteh and Ular Batang Padang, *Wray* 1176, 1514. "Used for torches in fishing by Sakais."

3. **Castanopsis malaccensis,** *Gamble* [Fagaceae]; *C. javanicae*, A.DC., affinis sed cupulae spinis tenuioribus, foliis basi rotundatis, ramulorum lenticellis vix conspicuis.

Arbor; ramuli graciles, cortice nigro-brunneo vix lenticellato; innovationes fusco-pubescentes; gemmae ovoideae, perulis ovato-acutis. *Folia* haud coriacea, ovata vel lanceolata, apice acuminata et saepe mucronata, basi saepe inaequaliter rotundata, 5–10 cm. longa, 3–4 cm. lata, supra juventute lepidoto-puberula, postea glabra, siccitate olivacea, infra minute fusco-puberula, margine integro; costa gracilis, supra impressa; nervi utrinque 8–10, ad marginem curvati; nervuli transversi multi, reticulationem areolatam includentes; petiolus gracilis, 0·8–1 cm. longus. *Flores* ignoti. *Fructus* (immaturi) globosi, 1·5–2 cm. diametro, in spicis gracilibus axillaribus ad 10 cm. longis; cupula tenuis, densissime et fere omnino spinarum rectarum acutissimarum 1–1·5 cm. longarum fasciculis tecta; spinae raro ramosae, acumine ultimo excepto pilis fuscis strigosis munitae; nuces plerumque 3, sericeae.

Malay Peninsula. Malacca: *Maingay*, K.D. 1461; Brisa, *Derry* 947.

4. **Castanopsis Scortechinii,** *Gamble* [Fagaceae]; *C. malaccensi*, Gamble, affinis, spinis magis ramosis pilis longis strigosis tectis, foliis ellipticis infra dense ferrugineo-pubescentibus.

Arbor; ramuli crassi, cortice griseo, conspicue furfuraceo-pubescentes; gemmae ovoideae, perulis lanceolatis acuminatis patentibus 5 mm. longis. *Folia* subcoriacea, elliptica vel paullo oblanceolata, apice cuspidato-acuminata, basi acuta, 8–12 cm. longa, 3–5 cm. lata, supra costa excepta glabra, siccitate olivacea, infra dense ferrugineo-pubescentia, margine integro; costa gracilis, pubescens; nervi utrinque 12–15, graciles et paullo impressi, primum fere recti, deinde ad marginem curvati; nervuli transversi multi, irregulares, recticulationem obscuram includentes; petiolus crassus, brevissimus, 5 mm. longus, pubescens. *Spicae* ♂ ignotae, ♀ circa 15 cm. longae, axillares vel ramulis ultimis laterales; rhachis grisea et furfuraceo-pubescens. *Flores* ♀ solitarii, bracteolis brevibus suffulti. *Fructus* globosi, circa 2 cm. diametro; cupula spinarum peracutarum ad 1·2 cm.

longarum fasciculis tecta; spinae cervi cornus more ramosae et pilis longis fulvis munitae.

Malay Peninsula. Perak (without number or locality), *Scortechini.*

5. **Castanopsis fulva,** *Gamble* [Fagaceae]; *C. costatae,* A.DC., affinis, nucibus 3 nec 1, spinarum fasciculis vix in annulis dispositis, ramulis haud lenticellatis et foliis infra furfuraceo-tomentosis differt.

Arbor ad 18–24 m. alta et 45–60 cm. trunci diametro, ramis patentibus; ramuli crassi, purpureo-brunnei, dense fulvo-tomentosi, vix lenticellati; gemmae ovoideae, perulis ovatis acuminatis tomentosis. *Folia* coriacea, elliptica vel elliptico-oblonga, apice breviter et abrupte acuminata, basi acuta vel paullo rotundata, 8–16 cm. longa, 3–7 cm. lata, supra lucida, glabra, infra furfuraceo-villosa, margine integro incrassato recurvo; costa crassa, supra impressa, siccitate fulvo-tomentosa; nervi utrinque 12–16, paralleli, primum fere recti, deinde curvati et prope marginem arcuati; nervuli transversi haud prominentes, irregulares; petiolus 1·2–2 cm. longus, fulvo-tomentosus. *Spicae* ♂ ignotae, ♀ ad 18 cm. longae; rhachis griseo-tomentosa. *Flores* ♀ plerumque per 3 aggregati, bracteolis multis ovato-lanceolatis imbricatis suffulti; perianthium griseo-tomentosum; styli breves, patentes. *Fructus* globosi, 2–2·5 cm. diametro, in spicis circa 20 cm. longis; cupula tenuis, plus minusve dense spinarum acutarum 4–5 mm. longarum fasciculis tecta; spinae cervi cornus more ramosae, curvatae, complanatae; fasciculi breviter caulescentes; nuces 1–4, pericarpio sericeo–villoso, umbone conspicuo.

Malay Peninsula. Perak: Batang Padang, 90–150 m., *King's Collector* 7751. Selangor: Sungei Buloh, *Mohamund Hashim* for *A. M. Burn-Murdoch* 38.

6. **Castanopsis Andersonii,** *Gamble* [Fagaceae]; *C. Scheffelianae,* Hance, affinis, foliis longioribus magis nervosis, petiolo longiore, fructus aculeis bis longioribus differt.

Arbor; ramuli modice crassi, cortice griseo-brunneo, ultimi minute fulvo-pubescentes; gemmae globosae, glabrae, perulis ovatis acutis vel acuminatis. *Folia* tenuiter coriacea, obovata vel oblanceolata vel elliptico-oblonga, apice acuta, basi acute attenuata, 8–16 cm. longa, 3–6 cm. lata, supra glabra, lucida, olivacea, infra rufo-brunnea, margine integro paullo recurvato; costa gracilis, prominens; nervi utrinque 10–15, ad marginem curvati et ibi arcuati; nervuli transversi obscuri, subparalleli, reticulationem areolatam includentes; petiolus gracilis, 1·5–2·5 cm. longus. *Spicae* ♂ graciles, ad 20 cm. longae, in paniculis terminalibus vel axillaribus; ♀ ignotae. *Flores* ♂ solitarii vel fasciculati, bracteolis ovatis 1 mm. longis; perianthii lobi 6, fere liberi, ovati, villosi, 1 mm. longi; stamina 12, filamentis longis et antheris parvis globosis; pistillodium pervillosum. *Fructus* sessiles, in spicis crassis circa 15 cm. longis, globosi vel duplo-globosi et transverse elongati, obscure 4–canaliculati, 2·5 cm. alti, 3·5 cm. longi et 2 cm. lati; cupula crassa, spinarum acutarum vix

ramosarum 0·5–1 cm. longarum fasciculis tecta; spinae fulvo-puberulae, curvatae, complanatae, striatae; nuces 3, quarum 1 vel 2 abortivae, ovoideo-complanatae, praeter basim rugosam dense rufo-sericeae.

Malay Peninsula. Malacca: Sungei Hudang, *Goodenough* 1593. Singapore: *T. Anderson* 85; *Kurz; Hullett* 74; Changi, Tanglin and in Garden Forest, *Ridley* 3388, 3389, 10162, 11353.

7. **Castanopsis megacarpa,** *Gamble* [Fagaceae]; species insignis fructu magno ad 5–6 cm. diametro spinarum longarum uno latere excepto fasciculis praedito, glande unica, pericarpio cupulae percrassae adnato, foliis infra cinnamomeo-pubescentibus.

Arbor magna, ad 12–18 m. alta et 60–90 cm. trunci diametro, ramis patentibus; ramuli modice crassi, cortice brunneo, lenticellis parvulis; gemmae ovoideae, perulis lanceolatis fulvo-velutinis. *Folia* coriacea, oblonga vel elliptico-oblonga vel elliptica, apice breviter cuspidato-acuminata, basi aliquando inaequaliter acuta vel rotundata, e 8–14 cm. longa et 3–4 cm. lata ad 16–24 cm. longa et 5–9 cm. lata, supra glabra, olivacea, infra minute fulvo- vel cinnamomeo-pubescentia, margine integro recurvo; costa modice crassa, prominens; nervi utrinque 12–16, paralleli, leviter curvati ad marginem et ibi fortiter curvati; nervuli transversi multi, subparalleli, reticulationem obscuram includentes; petiolus 1·5–2·5 cm. longus, basi inflatus. *Spicae* graciles, ad 20 cm. longae, in paniculis laxis terminalibus vel axillaribus, praecipue ♂; rhachis gracilis, angularis. *Flores* ♂ in glomerulis bracteola ovata suffultis; perianthii lobi 6, fere liberi, villosi, 1 mm. longi; stamina 12, filamentis subbrevibus et antheris parvis globosis; pistillodium parvum, villosum; ♀ ignoti. *Fructus* globosi, maturi ad 5–6 cm. diametro, in spicis gracilibus; cupula percrassa (basi 1 cm., medio 5 mm.), granulosa, uno latere excepto tuberculis raris crassis stipitem formantibus cujus e vertice radiant spinae graciles pubescentes vel subglabrae 1–1·5 cm. longae cervi cornus more ramosae; glans 1, pericarpio cupulae umbone excepto adnato; semen ovoideum, 2·5 cm. longum, 2 cm. diametro, testa pubescente, cotyledonibus sinuatis.

Malay Peninsula. Perak: up to 600 m., Larut and Kinta, *King's Collector* 3488, 3939, 6386, 6469, 6522, 7070. Malacca: *Maingay* K.D. 1459/3; Ayer Panas, *Goodenough* 1316; Sungei Udang, *Derry* 1093. Singapore: Bukit Timah, etc., *Ridley* 5118, 6683, 6894, *Cantley* 25.

This species with *C. Ridleyi* and *C. Andersonii* was included in the Flora of British India and in Sir George King's Monograph under *Castanopsis javanica*, A.DC. from which it differs entirely in its fruit.

8. **Castanopsis Ridleyi,** *Gamble* [Fagaceae]; *C. megacarpae*, Gamble, affinis, sed foliis minoribus lanceolatis, fructu multo minore, cupula omnino spinarum fasciculis in annulis obliquis tecta.

Arbor magna, ad 18–24 m. alta et 60–90 cm. trunci diametro, ramis patentibus; ramuli graciles, cortice brunneo, lenticellis multis pallidis rotundatis; gemmae ovoideae, perulis lanceolatis

fulvo-pubescentibus. *Folia* coriacea, lanceolata, apice breviter acuminata et mucronata, basi plerumque inaequaliter acuta vel rotundata, 6–13 cm. longa, 3–5 cm. lata, supra glabra, lucida, olivacea, infra glaucescentia, minute puberula, margine integro recurvo; costa gracilis, supra paullo impressa, infra prominens; nervi utrinque 10–14, paralleli, ad marginem fere recti et ibi subito curvati; nervuli transversi multi, paralleli, ramosi, reticulationem areolatam includentes; petiolus gracilis, 1–1·5 cm. longus. *Flores* ignoti. *Fructus* oblongi vel globoso-oblongi, 3 cm. longi, 2–2·5 cm. diametro, in spicis gracilibus circa 10–12 cm. longis; rhachis vix 2 mm. diametro; cupula crustacea, granulosa, 3 mm. crassa, glabra vel paullo fusco-puberula, spinarum gracilium fasciculis raris stipitatis 0·8–1 cm. longis in annulis obliquis omnino tecta; spinae rectae vel curvatae, cervi cornus more ramosae, apice excepto strigose pubescentes; glans 1, ovoideo-oblonga, 2·5 cm. longa, pericarpio umbone exserto excepto cupulae adnato; semen oblongum, obtusum, testa membranacea sericea, cotyledonibus irregularibus.

Malay Peninsula. Perak: on low ground, *King's Collector* 6831. Malacca: Sungei Udang, *Goodenough* 1479.

XXXII.—DECADES KEWENSES

Plantarum Novarum in Horti Regii Conservatarum.

DECADES LXXVIII.—LXXIX.

771. **Clematis Bourdillonii,** *Dunn* [Ranunculaceae]; *C. Gourianae*, Roxb. et *C. hedysarifoliae*, DC., affinis, a priore floribus minoribus et connectivo producto, a secunda foliis planis integris et planta tota minus pubescente distincta.

Frutex alte scandens, praeter flores glaber. *Folia* ternata vel biternata; foliola lanceolata vel ovata, 6–9 cm. longa, acuta, apiculata, integra, tandem reticulata; petioli foliis bis breviores. *Flores* 2 cm. diametro in paniculas terminales axillaresque dispositi. *Sepala* 4, lanceolato-oblonga, subanthesi reflexa, extus pubescentia, intus glabra, margine tomentosa. *Staminum* filamenta linearia, glabra, antheris latiora, connectivo in appendicem 1 mm. longam producto. *Achaenia* non visa.

India. Travancore: Merchiston Estate, evergreen forests, 750 m., flowering in April and May, *Bourdillon* 554, 860.

772. **Clematis theobromina,** *Dunn* [Ranunculaceae]; a *C. smilacifolia*, Wall., foliis trifoliolatis, tomento interno sepalorum persistente antherisque muticis distincta.

Frutex alte scandens, praeter flores glaber. *Folia* ternata vel superiora simplicia; foliola ovata, 6–12 cm. longa, basi obtusa vel cordata, apice acuta vel acuminata, integra, palmatim 5–9-nervia; petioli foliis paulo breviores, basi semi-amplexicaules. *Flores* 4–6 cm. diametro, solitarii, axillares et terminales; pedunculi 7–11 cm. longi, bracteolis 2 foliaceis prope basin ornati. *Sepala* 4–6, oblongo-lanceolata, apice obtusa, utrinque velutina, extus cacaina, intus rubida, margine scariosa concolore,

anthesi patentia. *Staminum* filamenta antheris latitudine aequalia, eis 6–9-plo longiora, antheris post anthesin spiraliter tortis, connectivo haud producto. *Achaenia* ovoidea, hirsuta, caudis longis plumosis.

India. Madras Pres.: Coimbatore Dist.; Nilgiri hills, Conoor, 2000–2500 m., *Clarke* 10987, 11080; Neddivattam, *Lawson*. Flowering from March to September.

773. **Sageraea grandiflora,** *Dunn* [Anonaceae]; *S. Dalzellii*, Bedd., floribus bis majoribus, staminibus bis paucioribus distincta.

Arbor pulchra, magna vel mediocris, praeter gemmas et ovaria glabra, cortice griseo rugoso. *Folia* oblonga, 25–35 cm. longa, 7–10 cm. lata, basi rotundata, apice breviter acuminata, integra, utrinque laevia, nervis marginem approximantibus 10–12-paribus; petioli 8–9 mm. longi. *Flores* in nodis infra folia fasciculati, pedunculis 2·5–3 cm. longis. *Sepala* 3, lata, ciliata, 2–3 mm. longa, basi connata. *Petala* 6, imbricata, rotundata, ciliata, exteriora 1·5 cm. longa, interioribus bis majora. *Stamina* 12, obovata, antherae loculis distantibus. *Ovaria* 3, strigosa, stigmate brevi integro; ovula 12–14. *Fructus* nondum visus.

India. Travancore: Keni, evergreen forest, 60–70 m., *Bourdillon* 469.

774. **Uvaria eucincta,** *Bedd. ex Dunn* [Anonaceae]; ab *U. macropoda*, Hook. f. et Thoms., et calyce globoso apice obtuso anthesi irregulariter rumpente distincta.

Frutex magnus, scandens. *Folia* oblonga, 15–25 cm. longa, apice breviter acuminata, basi rotundata, supra glabra, subtus paullo pilis stellatis rufis conspersa; petioli 6–10 mm. longi. *Flores* polygami, solitarii, 4·5–5 cm. diametro, foliis oppositi; pedunculi ut calyces tuberculis rufis scabri, 1 cm. longi, crassi. *Calyx* globosus, 1·2 cm. diametro, apice rotundatus, anthesi irregulariter rumpens. *Petala* 6, ovata, apice rotundata, basi coalita, utrinque tomentella. *Stamina* ∞, in floribus masculis ob apices truncatos pulvinos semiglobosos formantia, in bisexualibus annulos circum carpella efficientia. *Ovaria* numerosa, multi-ovulata.

India. Madras Pres.: Ganjam District; Goomsur Hills, *Beddome* 49; Russelondak Hills, *Beddome* 50; hills above Kurcholi, *Beddome* 51.

775. **Goniothalamus rhynchantherus,** *Dunn* [Anonaceae]; a *G. Thwaitesii*, Hook. f. et Thoms., antheris rostratis distincta.

Arbor parva, praeter flores omnino glabra. *Folia* oblonga, 9–16 cm. longa, apice breviter acuminata, basi obtuse cuneata, venis inconspicuis 10–12-paribus; petioli 6–9 mm. longi. *Flores* solitarii, axillares, 1·2–1·5 cm. longi; pedunculi 0·8–1·2 cm. longi. *Sepala* 3, ovata, acuta, apice obtusa, extus subglabra, intus sparse puberula. *Petala* 6, 2-seriata, exteriora 1–1·3 cm. longa, primo valvatim cohaerentia, mox apice hiantia et tandem distincta, erecta, cetero sepalis similia; interiora dimidio minora, utrinque pubescentia, apice supra genitalia mitriformia, basi hiantia. *Stamina* ∞, sessilia, antheris cuneatis apice in rostrum conicum

1 mm. longum productis. *Ovaria* pauca, biovulata. *Carpella* immatura oblonga, glabra, subsessilia.

India. Tinnevelly District: Courtallum; in dense jungle, *Wight* 29 (Kew distribution number); Paupanassum Hills and Courtallum, *Beddome*; Kannikatii, *Barber* 3006. Travancore, *Beddome* 52.

776. **Unona Ramarowii,** *Dunn* [Anonaceae]; carpellis solidis glabrescentibus paullo torulosis ab *U. pannosa*, Dalz., quae baccas pulposas velutinas globosas habet, distincta.

Arbor parva vel frutex ramulis rugulosis, novellis pubescentibus. *Folia* (7–) 10–20 cm. longa, oblongo-acuminata, basi obtuse cuneata, pellucido-punctata, papyracea, supra opaca, glabra, subtus sparsissime adpresse hirsuta, venis 8–10-paribus supra impressis subtus prominulis; petioli 4–5 mm. longi. *Sepala* 3, ovata, acuta, villosa, 6 mm. longa. *Petala* 6, straminea, lanceolata, praeter unguem interne glabrum tomentosa, 3 exteriora anguste lanceolata, 3–5 cm. longa, 3 interiora paullo breviora sed latiora. *Torus* paullo elevatus, strigosus. *Stamina* ∞, cuneata, connectivo truncato anterius paullo producto. *Ovaria* 8–10, dense hirsuta; stigma depresso-capitulatum; ovula 2–4. *Carpella* matura 3–5, cylindrica vel torulosa, 1–2·5 cm. longa, 0·6 cm. lata, subito acuminata, basi in pedicellum brevissimum angustata, subglabra; pericarpium tenue. *Semina* 1–3, septis transversis divisa, 4 mm. diametro, testa laevi.

India. Travancore: Quilon (fruit in October), *Wight*; Pooleary Pass near Quilon, *Madras Herb.*; Aryankavu evergreen forests, *Bourdillon* 21, *Rama Row* 1845; moist forests, 600–1300 m., *Bourdillon* 44; Makará, evergreen forests (flowering September and October), *Rama Row* 1655. Madras Pres., Malabar Dist.: Wynaad, *Beddome*; S. Kanara Dist. Ghats, *Madras Herb.*

777. **Crotalaria Bourneae,** *Fyson* [Leguminosae-Genisteae]; a *C. oralifolia*, Wall. ex Fyson, ramulis rigidis, bifurcatim ramosis, corolla inclusa recedit.

Caulis usque e radice bifurcatim ramosus, 10–15 cm. longus, plus minusve erectus, gracilis, pubescens. *Folia* elliptica vel oblonga, utrinque obtusa vel subacuta, 1·8–2 cm. longa, 5–6 mm. lata, in sicco supra nigra, pagina utraque dense pubescentia, nervis lateralibus utrinque 3–4 infra prominentibus; stipularum alae apice usque ad 8 mm. latae, subito in alam vix conspicuam paulo ultra internodii medium extensam contractae. *Pedunculi* 1·5–2 cm. longi, uniflori, circiter medium bractea floreque aborto instructi; bracteolae lineari-oblanceolatae. *Calycis* tubus 2 mm. longus, lobi 1·2 cm. longi. *Corolla* in calyce inclusa, vix 7 mm. longa. *Legumen* 2·6 cm. longum, 7 mm. diametro, stipite 2 mm. longo suffultum.

South India. Madras: Pulneys, 2100 m., *Fyson* 1093, 2053, 2116, 2164.

778. **Crotolaria conferta,** *Fyson* [Leguminosae-Genisteae]; a *C. scabrella*, W. et A., foliis minoribus, corolla calycem superante, legumine breviore distincte stipitato recedit.

Caules e radice perenni, graciles, 15–20 cm. longi. *Folia* elliptica, utrinque acuta, 1–1·3 cm. longa, 2–6 mm. lata, pagina utraque sericeo-pubescentia, supra scabridula, in sicco conspicue cuprea, nervis lateralibus haud conspicuis; stipularum alae apice 7 mm. latae, ad nodum proximum extensae eumque versus gradatim marginibus curvatis angustatae. *Pedunculi* 2 cm. longi, uniflori, bracteis paucis parvis floribusque sterilibus instructi. *Calyx* 1·2 cm. longus, sericeus. *Corolla* calycem superans. *Legumen* 2 cm. longum, 7 mm. diametro, stipite 1·5 mm. longo suffultum.

South India. Madras: Pulneys, in grass of the open downs, *Fyson* 473.

779. **Crotalaria ovalifolia,** *Wall. ex Fyson* [Leguminosae-Genisteae]; affinis *C. alatae,* Hamilt., a qua floribus majoribus, stipulis superne latioribus inferne valde angustatis, foliis brevioribus et latioribus, ramis debilioribus recedit; a *C. scabrella,* W. et A., ramis debilioribus, floribus minoribus, stipite leguminis breviore et foliis obtusis recedit.

Radix crassa, perennis; ramuli tenues, 1·5–3 cm. longi, diffusi vel magis minusve erecti, juventute pubescentes. *Folia* elliptica ad obovata vel orbicularia, obtusa vel emarginata, 1–2·5 cm. longa, pagina superiore et nervis inferiore primo molliter griseo- vel brunneo-pubescentia, demum glabrescentia, supra in sicco fusca atrave, nervis lateralibus utrinque 3–4 infra prominentibus, subsessilia; stipularum alae apice 6–7 mm. latae, usque ad nodum proximum vel ad internodii medium tantum productae gradatimque angustatae. *Pedunculi* 3–5 cm. longi, uni- vel bi-flori, floribus satis distantibus; bracteae 4 mm. longae; bracteolae lanceolatae, 3 mm. longae. *Calycis* tubus 2 mm. longus, lobis 1–2 cm. longis pubescentibus. *Corolla* inclusa vel vix exserta. *Legumen* 3 cm. longum, 1 cm. diametro, sessile vel subsessile.—*C. rubiginosa*, var *typica*, Baker in Hook. f. Fl. Brit. Ind. ii. p. 69, non Willd.

South India. Madras: Nilgiris, *Wight* 689, 690, 690A, *Schmidt, Gardner*; Snowdon, 2400 m., *Fyson* 659; Pulneys, *Wight* 586 (Kew Distr.); Dindigul, *Wall. Cat.* 5411; Maybaum, *Adams.*

780. **Potentilla Purdomii,** *N. E. Brown* [Rosaceae-Potentilleae]; species distinctissima, foliis pinnatis utrinque viridibus foliolis basi latissime sessilibus, carpellis apice tantum pilosis stylo filiformi ab omnibus differt.

Herba perennis, ad 30 cm. alta. *Folia* radicalia, pinnata, 8–15 cm. longa, 1·5–2·7 cm. lata, erecta, apice recurva; foliola 11–20-juga, 0·6–1·5 cm. longa, 0·7–1·7 cm lata, suborbicularia, basi latissime sessilia (haud contracta), 5–11-dentata, alterna parte superiore minora ovata integra, supra glabra, subtus pilis perpaucis conspersa, utrinque viridia; folia caulina 2–3, sessilia, pinnatisecta, 1·5–3·5 cm. longa, segmentis lanceolatis acutis integris; stipulae pinnatifidae. *Caules* floriferi ad 30 cm. alti, apice laxe 3–5-flori, minute puberuli, rubescentes. *Pedicelli* 1–3·5 cm. longi, glanduloso-puberuli. *Sepala* exteriora 3 mm. longa, lineari-lanceolata, subacuta; interiora 4·5–6 mm. longa,

anguste deltoidea, acuta, glanduloso-pubescentia. *Corolla* 1·5–1·7 cm. diametro, lutea; petala 6–6·5 mm. longa, 7–8 mm. lata, late obcordata, basi biauriculata. *Stamina* 16-25. *Discus* glaber. *Receptaculum* breviter conicum, glabrum. *Carpella* 1·5 mm. longa, apice tantum pilosa; stylus oblique terminalis, 3 mm. longus, filiformis, stigmate acuto.

North China, without precise locality, *Purdom* 563.

Described from a living plant sent to Kew by Messrs. J. Veitch & Sons, who raised it from seed collected by Mr. Purdom in North China.

There seems to be no species in Wolf's recent monograph near which this can be placed. In habit it is something like *P. leuconota*, Don, but the silvery leaves, narrow based leaflets and small flowers of the latter are utterly different from those of *P. Purdomii*, whilst the long subterminal filiform style and hairy carpels of *P. Purdomii* would, according to Wolf's arrangement, place it far away from that species. *Wilson* 3454 I think belongs here, but in that the flowering stems are only 10–15 cm. long, otherwise it agrees with Purdom's plant.

781. **Lasianthus coffeoides,** *Fyson* [Rubiaceae-Psychotrieae]; ab affini *L. capitulato*, Wight, indumento petiolorum inflorescentiaeque magis adpresso, foliis angustioribus brevioribusque, calycis lobis multo minoribus recedit.

Caulis simplex, erectus, ramis longis gracilibus tenuibus adpresse pubescentibus. *Folia* insigniter bifaria, anguste ovato-elliptica, 9–10 cm. longa, 3–3·5 cm. lata, supra glabra, nitida, infra nervis adpresse pubescentia, nervis lateralibus utrinque 6–9, petiolo 5 mm. longo adpresse pubescente suffulta; stipulae deltoideae, 2–3 mm. longae. *Pedunculi* 2 mm. longi, flores 3–4 subsessiles gerentes, simul ac receptaculum, bracteae calyxque valde adpresse pubescentes. *Receptaculum* 1·5–2 mm. altum. *Calycis* tubus lobis aequilongus, receptaculo dimidio brevior. *Corollae* tubus 5 mm. longus, lobis oblongis 3 mm. longis intus pubescentibus. *Antherae* inclusae, fere sessiles. *Stylus* gracilis, ramis 4 divergentibus 0·5 mm. longis. *Fructus* niger, 5 mm. longus, calycis lobis persistentibus ornatus, 3 (vel ultra?) locularis.

South India. Madras: Pulneys, *Wight*; in the woods near Kodaikanal and on the downs, *Fyson*.

The slender, erect, unbranched stem and the long, very slender, horizontal branches, with leaves all facing upwards, and the axillary white flower gives this very much the appearance of the cultivated coffee.

782. **Rhododendron burmanicum,** *Hutchinson* [Ericaceae-Rhododendreae]; affinis *R. formoso*, Wall., foliis supra densissime lepidotis facile distinguitur.

Frutex ramosus; ramuli brunnei, parcissime pilosi. *Folia* oblanceolata vel subobovato-oblanceolata, sensim obtuse acuminata, basi attenuata, 6–8 cm. longa, 1·75–3 cm. lata, subcoriacea, utrinque densissime lepidota, juniora tenuiter ciliata, demum glabra; nervi laterales utrinque 9–11, a costa media sub angulo 45° divergentes, utrinque inconspicui; petioli robusti, 0·5–1 cm.

longi, circiter 3 mm. crassi, brunneo-lepidoti, basi interdum parce ciliati. *Perulae* exteriores late ovatae, longe caudato-acuminatae, submembranaceae, extra dense lepidotae, longe ciliatae, interiores suborbiculares, mucronatae, margine albo-villosae, extra parce lepidotae. *Flores* terminales, 5–6, viridi-albi, valde proterogyni. *Calyx* subnullus, longe piloso-ciliatus, pilis reflexis. *Corollae* tubus campanulato-obconicus, basi 1 cm., apice 3–3·5 cm. diametro, extra lepidotus, intra postice flavo-maculatus; lobi 5, subpatuli, ovato-rotundati, 2 cm. longi et diametro. *Stamina* 10, leviter exserta; filamenta 2·5–3·5 cm. longa, inferne albo-villosa; antherae 4–5 mm. longae. *Discus* carnosus, lobatus. *Ovarium* 6–loculare, oblongum, dense lepidotum, leviter costatum; stylus exsertus, 4 cm. longus, 1·5 mm. crassus, inferne parce lepidotus, stigmate capitato fere 0·5 cm. expanso coronatus.

Burma. Described from fresh material from the Royal Botanic Gardens, Glasnevin, grown from living plants collected by Mrs. Wheeler Cuffe on Mount Victoria, Burma. The flowers are very sweet scented; the large stigma protrudes long before the corolla expands.

783. **Andersonia concinna,** *N. E. Brown* [Epacridaceae-Epacreae]; affinis *A. variegatae,* Sond., sed foliis longioribus patulis acutioribus, bracteis longioribus et acuminatis et floribus majoribus differt.

Frutex nanus, ramosus, foliosus. *Folia* alterna, 5–8 mm. longa, basi 3 mm. lata, amplexicaulia, ovata, acute vel subobtuse acuminata, torta, patula, glabra. *Flores* ad apicem ramorum capitato-glomerati vel interdum solitarii, sessiles. *Bracteae* 12–14, imbricatae, ovatae vel lanceolatae, subpungenti-acuminatae, interiores 5·5 mm. longae, calyce multo breviores, exteriores gradatim minores, virides vel apice sordide purpurascentes, glabrae vel minutissime subpuberulae. *Sepala* libera, erecta, 8 mm. longa, 1·5–2 mm. lata, anguste lanceolata, 3 exteriora obtusa, 2 interiora acuta, glabra, minutissime ciliata, pulchre rosea. *Corolla* 7 mm. longa, sepalis brevior; tubus 3 mm. longus, glaber; lobi 4 mm. longi, 1 mm. lati, lineari-lanceolati, obtusi, extra glabri, intra apice glabri inferne barbati. *Stamina* libera, 4·5 mm. longa, filamentis superne pubescentibus. *Ovarium* apice truncatum, glabrum; stylus 5 mm. longus, medio pubescens; stigma capitatum.

Western Australia. Narrogin, *F. Stoward* 1.

784. **Olea Bournei,** *Fyson* [Oleaceae-Oleineae]; ab *O. paniculata,* Br., et *O. glandulifera,* Wall., foliorum nervis lateralibus paucioribus etiamque ab hac foliis brevioribus magis rotundatis magisque acuminatis recedit.

Arbor, ramulis decussatis, cortice griseo multi-lenticellato obtectis. *Folia* late ovata vel elliptica, apice acuminata, basi in petiolum angustata, 6 cm. longa, 3·5 cm. lata, pagina utraque glabra, viridia, nervis lateralibus utrinque 2–3, petiolo gracili 2–3 cm. longo erecto vel ramulo adpresso suffulta. *Paniculae* et terminales et in axillis supremis, 5–10 cm. longae et diametro, ramis oppositis horizontalibus, pedicellis 1 mm. longis; alabastra globosa. *Corolla* rotata, 4 mm. longa, calycem duplo superans, lobis rotun-

datis 1·5 mm. longis. *Stamina* corollae aequialta, divergentia, antheris magnis. *Stylus* brevis, lateraliter compressus. *Drupa* viridis, anguste ovoidea, 1·2 cm. longa, 5 mm. diametro; semina latere uno canaliculata.

South India. Nilgiri Plateau: near Pykara, 2040 m., *Fyson* 2462, 2497, *Wight* Hb. Propr.; Avalanche, *Wight*, K.D. 1796; Bababoodan Hills, *Hohenacker* 503.

O. Bournei was included by C. B. Clarke in Fl. Brit. India, vol. iii. p. 612 under *O. glandulifera*, Wall., a native of Nepaul.

785. **Syringa alborosea,** *N. E. Brown* [Oleaceae-Syringeae]; affinis *S. Rehderianae*, Schneider, sed ramis glabris, foliis subtus viridibus, inflorescentia subparva laxa et calyce distincte dentato differt.

Frutex 2·5–3 m. altus, cortice brunneo; rami juniores glabri. *Foliorum* petioli 1–2 cm. longi, supra sulcati, plus minusve puberuli; laminae 4·5–9 cm. longae, 2·5–5 cm. latae, ellipticae, acutae vel subobtusae et apiculatae, basi latissime rotundato-cuneatae, in petiolo decurrentes, utrinque parce pubescentes, virides, subtus pallidiores. *Inflorescentia* terminalis, erecta, 5–12 cm. longa, 4–6 cm. lata, laxa, pilis patulis pubescens. *Pedicelli* ad 0·75 mm. longi. *Calyx* 3 mm. longus, campanulatus, 2–4–dentatus, pubescens, dentibus late ovatis subacutis. *Corollae* tubus 0·8–1 cm. longus, pallide roseus; lobi 2·5–3 mm. longi, ovati, acuti, patuli, albi.

China, without precise locality, *Wilson* 1739.

Described from a living plant raised by Messrs. J. Veitch and Sons from seed collected by E. H. Wilson in China, and presented by them to Kew in 1913, where it flowered in June, 1914.

248 786. **Gentiana apiata,** *N. E. Brown* [Gentianaceae-Swertieae]; affinis *G. nivali*, Pall., sed floribus subduplo minoribus et calyce parvo facile distinguitur.

Herba perennis, omnino glabra. *Folia* radicalia 5·5–8 cm. longa, 5–7 mm. lata, lineari-lanceolata, acuta, uninervia, costa subtus carinata; folia caulina 3·5–5·5 cm. longa, 0·9–1·3 cm. lata, lineari-lanceolata, acuta, 3-nervia. *Caules* florentes ad 16 cm. alti, pallide virentes, internodiis 3–5·5 cm. longis. *Cymae* 1–3-florae, axillares et terminales, inferiores pedunculati, superiores sessiles. *Pedicelli* nulli. *Bracteae* 1·5 cm. longae, 2·5 mm. latae, foliiformes. *Calycis* tubus 7 mm. longus, tubuloso-campanulatus vel interdum spathaceo-fissus, pallide virescens; lobi inaequales, patuli, 1–5 mm. longi, virides. *Corolla* 2·5 cm. longa, 2 cm. diametro, infundibuliformis, pallide viridi-alba punctis lineisque atroviridibus notata; tubus 2–2·2 mm. longus, subangularis; lobi 5 mm. longi, basi 8–9 mm. lati, suboblique late deltoideo-ovati, subacuti; squamae nullae. *Stamina* inclusa; antherae oblongae, subbasifixae, extrorsae. *Ovarium* stipitatum; stigma bilobum.

North China, without precise locality, *Purdom* 406.

Described from a living plant sent to Kew by Messrs. J. Veitch and Sons, who raised it from seed collected by Mr. Purdom in North China.

787. **Alseodaphne Keenanii,** *Gamble* [Lauraceae-Cinnamomeae]; *A. petiolari,* Hook. f., affinis, foliorum reticulatione magis minuta, foliis infra pubescentibus apice obtuse acuminatis, paniculis foliis multo longioribus magis ramosis ramis gracilioribus differt.

Arbor magna; ramuli crassi, fere nigri, lenticellis paucis inconspicuis, ultimi minute ferrugineo-puberuli. *Folia* subcoriacea, elliptica, apice obtuse breviter acuminata, basi acuta, 12–24 cm. longa, 10–12 cm. lata, supra glabra, opaca, minute reticulata, infra glaucescentia et saltem juniora minute ferrugineo-puberula; costa gracilis, supra canaliculata, infra prominens; nervi utrinque 9–11, supra plani, infra prominentes, curvati et prope marginem arcuatim juncti; nervuli transversi distantes, conspicui, saepe ramosi, reticulationem areolatam includentes; petiolus crassus, 4–5 cm. longus. *Flores* in paniculas ramosas e foliorum ultimorum axillis ortas ad 35 cm. longas dispositi; pedunculus communis 10–15 cm. longus; rami multi, in cymas 5–6-floras desinentes; pedicelli graciles, stellato-puberuli, circa 2 mm. longi, fructiferi (immaturi) incrassati. *Perianthii lobi* ovati, stellato-puberuli, 3 exteriores 1·5–2 mm. longi, trinervii, 3 interiores 2–2·5 mm. longi, 5–nervii, in fructu caduci. *Stamina* minuta, ordinum i et ii oblonga, antheris glabris glanduloso-punctatis, filamentis villosis, 1 mm. longa, ordinis iii 1 mm. longa, antheris rectangularibus glanduloso-punctatis, filamentis brevibus villosis et glandulis 2 magnis subglabris juxta basim munita; ordinis iv staminodia minuta, 0·5 mm. longa, cordata, aliquando o. *Ovarium* ovoideum, glabrum, stylo brevi obliquo, stigmate capitato. *Drupa* matura non visa, immatura ellipsoidea, glabra, pedicello incrassato minute puberulo.

Burma. Myitkyina District at Chipwikha, 900 m., vern. 'Maru' Burm., 22nd Sept., 1912, *Maung Kyaw* 49 (Herb. Lace).

Assam. Cachar: at base of Goolteelah (near Dumcherra?) "panicle branches red appearing from a distance like flowers," Sept. 1873 *Keenan* (quoted in Fl. Br. India under *A. petiolaris,* Hook. f.).

788. **Rhopalocnemis ruficeps,** *Ridl.* [Balanophoraceae]; a *R. phalloide,* Jungh., rhizomate elongato repente, volva nulla, pedunculo cylindrico alto, capitulo cylindrico rubro distincta.

Rhizoma ramosum, elongatum, teres, ultra 15 cm. longum, 5 mm. crassum, flavum. *Squamae* et *volva* desunt. *Pedunculus* cylindricus, teres, 8–10 cm. longus, 7 mm. crassus, nudus, flavus. *Capitulum* ovoideum ad cylindricum, 4-10 cm. longum, 2–3 cm. crassum, roseum, bracteis caducis coccineis ornatum. *Bracteae* stipitatae, conicae, 4–6–angulatae, 5 cm. longae. *Flores masculi* minuti, 2 mm. longi. *Perianthii lobi* 4, oblongi, truncati, breviter ad bases connati. *Androecium* brevius, columna crassa, antheris ellipsoideis in capitulo oblongo obtuso, loculis linearibus 8. *Flores foeminei* minuti, complanati, perianthio elliptico tubuloso. *Styli* 2, stigmatibus discoideis. *Capilli* interflorales in utroque sexu copiosissimi, densi, flores includentes.

Malay Peninsula. Perak: Taiping Hills in dense forest, *Low, Ridley, J. Anderson*; Penang: *Stoliczka* in herb. Calcutta; Penara Bukit, *Ridley.*

789. **Triglochin Stowardii,** *N. E. Brown* [Naiadaceae-Juncagineae]; affinis *T. calcitrapae*, Hook., sed fructibus pedicellatis subduplo longioribus calcaribus duplo brevioribus et gracilioribus differt.

Herba annua, 10–14 cm. alta, glabra. *Folia* 3–5 cm. longa, 0·5 mm. crassa, terete-filiformia, acuta. *Pedunculi* 4–12 cm. longi, 0·5–0·75 mm. crassi, apice laxe racemoso–2–7–flori. *Pedicelli* 0·5–3 (fructu 2·5–8) mm. longi, adscendentes. *Perianthii* segmenta 6, lanceolato-ovata, acuta vel acuminata, concava, carinata; 3 exteriora 1·5–2 mm. longa, basi gibboso-calcarata; 3 interiora 2 mm. longa, ecalcarata. *Antherae* 6, sessiles. *Ovarium* 3–loculare; stigmata sessilia, truncata. *Fructus* 1·5 cm. longus, inferne 1·3 mm. crassus, attenuato-trigonus, apice truncatus, basi 6–calcaratus; calcaria 1·5 mm. longa, gracilia, incurvato-uncinata, subtus per paria membrana chartacea connexa.

Western Australia. Beverley, Sept. 1913, *F. Stoward* 35.

790. **Andropogon (Amphilophis) Grahamii,** *Haines* [Gramineae-Andropogoneae]; species *A. Ischaemo*, L., affinis, sed habitu robusto suffruticoso multiramoso, vaginis ramos subtendentibus ampliusculis, laminis plerumque glaberrimis, articulis racemorum brevius ciliatis, spiculis pedicellatis neutris ad glumas 2 vel 3 reductis.

Gramen perenne, suffruticosum. *Culmi* teretes, nitentes, saepe geniculati, crebre ramosi, ramis saepe ad nodos fasciculatis. *Foliorum* vaginae inferiores et intermediae ramos subtendentes, patentes, ampliusculae, striatae, superiores arctae, laeves, omnes glaberrimae, nisi ad nodos magis minusve pilosae; ligulae breves, truncatae; laminae lineares, sursum longe setaceo-attenuatae, 6–12 cm. longae, 3–4 mm. latae, glaucae, praeter margines scaberulos laeves, glaberrimae, rarius basi pilis perpaucis conspersae. *Racemi* 3–7, 3·5–5 cm. longi, flexuosi, multinodes, in rhachi communi raro 2 cm. excedente pedunculati, pedunculis teretibus glabris 5–8 mm. longis, axillis parce pilosulis; articuli uti pedicelli dense ciliati, ciliis summis iis paulo brevioribus, applanati, dorso vix exarati. *Spiculae sessiles* oblongae, 3·5 mm. longae, praeter apices saepe purpurascentes pallide virescentes; gluma I. apice truncata, inter carinas 5-nervis, carinis scabridociliolatis pilis longis nonnullis praecipue superne instructis, marginibus anguste implicatis, callo pilis ad 1 mm. (vel paulo ultra) longi obsito; gluma II. lanceolata, acuta, primam subaequans, laevis, margine hyalino tenuiter ciliolato, 3-nervis; gluma III. lanceolata, tenuiter hyalina, quam secunda vix quarta parte brevior, in margine tenuiter ciliolata, 1–3 nervis, nervis tenuissimis; gluma IV. angustissima, in aristam abeuns et cum ea 15–20 mm. longa. *Spiculae pedicellatae* neutrae, sessiles aequantes, sed angustiores, magis purpurascentes; gluma I. inter carinas 5–7-nervis, caeterum ut in spicula sessili, nisi minus rigida; gluma II. oblonga, 2·5 mm. longa, hyalina, tenuissime 1- vel 2-nervis; gluma III. oblonga, 1·5 mm. longa, enervis.

India. Central Provinces: in the Amakantak Hills, often gregarious in old jhumed lands (bewars), *Haines* 3646.

This species has been named after Mr. R. J. Graham, Economic Botanist, Central Provinces, India.

XXXIII.—HOW SAPROPHYTIC FUNGI MAY BECOME PARASITES.

G. Massee.

It is very generally believed that diseases of plants, caused by fungi, continue to increase in number, and in the case of cultivated plants this is probably true, not because the adaptive power of fungi is greater than at any previous period, but simply because the opportunities for exercising the adaptive power possessed by fungi are more frequent at the present time, too often due to a departure from the normal on the part of the host-plant, brought about by cultivation.

Quite recently my attention was called to a batch of *Clerodendron fallax*, Lindl., in one of the houses at Kew; the gardener had noticed the presence of numerous minute watery-looking drops, on the under surface of the leaves, an unusual phenomenon, not to be found on another batch of the same kind of plant growing under slightly different conditions as to temperature and moisture. On investigating the matter it was found that the under surface of the leaf, more especially towards the base, was studded with comparatively large, peltate glands, supported by a very short central stalk. These glands each exuded a liquid drop which had a very sweet taste. The ubiquitous floating spores of *Cladosporium epiphyllum*, Pers., found these sugary drops a congenial pabulum, and each gland was soon tipped with a fruiting tuft of *Cladosporium*. At first the *Cladosporium* was strictly confined to the glands, and depended on the secretion for its support, but it gradually passed from the saprophytic condition, and entered that of a facultative parasite, passing beyond the range of the gland and attacking the surrounding living tissue of the leaf, forming conspicuous brown, dead patches on the upper surface. Three weeks after the disease first appeared, the spores of the fungus were capable of infecting any portion of the leaf, quite apart from receiving an initial start on the sugary excretion from a gland. The above is a concrete example of a saprophytic fungus becoming a parasite within a brief period of time. It is unlikely that all the conditions necessary to effect this change will ever occur again, hence the epidemic will be of short duration, but it can be readily imagined that if the host-plant had been an outdoor crop, and the epidemic had remained unchecked, the fungus might have become a pronounced parasite, capable of continuing its ravages for all time.

Judging from the number of examples sent to Kew for determination, mechanical injuries of various kinds, often self-inflicted, are a source of perplexity as to their origin. Wind is the most important factor. The gourds that are trained up poles in the herbaceous ground furnish striking examples. When a young fruit happens to be overhung by a leaf, and the latter is gently swayed to and fro by the wind, the rigid hairs on the under surface of the leaf form a series of more or less parallel scratches on the surface of the fruit. As the direction of the wind changes, the series of lines on the fruit cross each other diagonally, or form a

more or less regular pattern. Such wounds are not very noticeable at first, but as the fruit increases in size the wounds are torn wider apart and periderm is formed along the edges of each wound, so that by the time the fruit has reached its full size, each individual scratch is clearly outlined by a raised ridge of whitish periderm. The above is what happens if no fungus appears on the scene, but as a rule the wounds while quite newly made are invaded by the spores of some facultative parasite, most frequently *Botrytis* or *Cladosporium*. In this case the original source of injury is soon obliterated, and a soft rot follows.

The leaves of gooseberries are frequently scratched by the spines on neighbouring branches, the sign that wind has been the active agent is indicated by the parallel rows of scars, which become clearly outlined by whitish periderm.

Holly leaves often suffer from the effects of wind, becoming wounded by the spines on the leaves of a neighbouring branch. When actual perforations are made, the injury is usually attributed to some insect. When the leaves are only slightly punctured, the wound often forms a starting point for one of the many micro-fungi attacking leaves, or a growth of periderm gives the leaf a spotted appearance.

The opportunities described above for saprophytic fungi having a tendency to become parasites, must necessarily be repeated in a wholesale manner in nature. In the majority of instances the opportunity is not of sufficiently long duration to enable the fungus to become an obligate parasite, which only means that a fungus has fed for so long a time on food supplied by one special kind of host-plant, that it cannot change, without undergoing at least very great inconvenience to itself, or if it has become rigid, cannot change under any circumstances. For this reason the evolution from saprophytic to parasitic fungi is not rapid, due simply to lack of opportunity, at the same time it cannot be doubted that a certain amount of headway is made in this direction, and the primary factor rendering possible such progress may be of a very trivial nature in itself.

XXXIV.—MISCELLANEOUS NOTES.

Mr. F. Glover.—Mr. F. Glover, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, a Sub-Inspector for the purposes of the Destructive Insects and Pests Acts under the Board of Agriculture and Fisheries.

Mr. W. N. Evans.—Mr. W. N. Evans, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, a Sub-Inspector for the purposes of the Destructive Insects and Pests Acts under the Board of Agriculture and Fisheries.

Dr. C. B. Robinson.—It was with great regret that we learnt of the murder of Dr. C. B. Robinson, of the Bureau of Science, Manila, in Amboina on December 5th, 1913. Dr. Robinson had gone to Amboina in order to collect over the classic ground visited by Rumphius, and to obtain as complete a collection as possible of the species figured and described by Rumphius. Mr. E. D. Merrill, who proceeded to Amboina immediately on hearing of Dr. Robinson's death, has sent us particulars of the melancholy event, and a copy of the official report of his death, and he also informs us that he has recovered and taken to Manila the whole of the botanical collections made in Amboina by Dr. Robinson. It is a matter of no small gratification to know that his valuable work has been preserved, and it is Mr. Merrill's intention to distribute the collection in two sets, one of which will consist of those plants that can be definitely connected with the species figured and described by Rumphius.

From the information sent to Kew by Mr. Merrill it would appear that the murder was committed largely from fear on the part of the Boetonese, perhaps also for the sake of robbery. Immediately after the murder had been committed, reflection appears to have followed, and in order to wipe out every trace of their deed the murderers threw the body into the sea without anything having been stolen. It is possible, as suggested in the official report, that Dr. Robinson was the victim of superstitious fear caused among the inhabitants by his sudden and unexplained appearance in the lonely spot to which he had walked unaccompanied. Dr. Robinson was very popular with the natives and with their children, and frequently made journeys alone, so that the true cause of the murder is somewhat obscure. His death caused general mourning among the population of Amboina.

Dr. Robinson was a British subject, a citizen of Nova Scotia, and for two years was in residence at Christ's College, Cambridge. It was only a few years ago that he visited Kew on his way from the Philippine Islands to Nova Scotia. His untimely end is a great loss to botanical science.

Joseph Reynolds Green, F.R.S.—The death of Reynolds Green on June 3rd will have come as a great shock to his many friends, and not least to those who were associated with him during his work at Kew.

Green began working in the Jodrell Laboratory in the autumn of 1892, and went on for some years, so far as his other engagements allowed. Two of his most important physiological papers were the outcome of this period, namely, his "Researches on the Germination of the Pollen-grain and the Nutrition of the Pollen-tube,"* and his memoir on "the Action of Light on Diastase and its biological significance."†

Green, besides being a most competent investigator, was an exceedingly pleasant man to work with, and very popular with

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* Phil. Trans. Royal Soc. B. 184 (1894) pp. 385–409.
† Ibid. B. 188 (1897) pp. 167–190.

those who met him in the laboratory. The writer looks back with much pleasure on the time when Green was with him at Kew.

Green was essentially a physiologist, in fact it was doubtful at one time whether animal or vegetable physiology would claim his allegiance. It was especially the chemical side of physiology, and above all the subject of enzymes, which interested him, as shown by his work on the physiology of germination and on the proteids of latex, besides the Kew papers cited above.

His researches in this field culminated in the publication, in 1899, of his important book on "The Soluble Ferments and Fermentation"; this work was translated into German, an honour which does not often fall to the lot of an English botanical author.

Other, more general, books of his were his well-known "Manual of Botany," 1895-6, and his "Introduction to Vegetable Physiology," 1900.

In his later years Green much interested himself in the history of botany, publishing, in 1909, a work on that subject, bringing down Sachs's classical History of Botany from 1860 to 1900.

At the time of his death he had just completed a work specially on the History of Botany in England, and it is hoped that this last product of his industrious life may soon see the light.

Green was for 20 years (1887-1907) Professor of Botany to the Pharmaceutical Society; afterwards he held the post of Hartley Lecturer in Vegetable Physiology in the University of Liverpool; in his own University he was Fellow and Lecturer of Downing College. He was elected a Fellow of the Royal Society in 1895.

D. H. S.

Hedychium flavescens.—A bundle of stems sent under the name of *Hedychium flavescens* has been recently received from the Director of Agriculture, Ceylon, in order that its paper-making qualities might be tested in comparison with *Hedychium coronarium*.

The material was accordingly submitted to Messrs. Clayton Beadle and Stevens, who report as follows:—

"The material arrived in very good condition, and, if it could be supplied in bulk in the condition in which it arrived, it would be a very convenient form for converting into paper.

"We tested it by ordinary paper-making processes, and found that it could be converted into paper, samples of which we enclose herewith, which in a large measure resembles the paper obtained from *Hedychium coronarium*.

"By a process of direct conversion, whereby *Hedychium coronarium* will yield paper equal to 90 per cent. of the dry weight of the stem, *H. flavescens* yielded 60 per cent. The probability is that, by ordinary paper-making processes, by boiling under pressure and subsequently beating and so forth, whereby *Hedychium coronarium* has yielded in bulk 60 per cent. of paper, the *H. flavescens* would yield probably about 40 per cent., but this is a point that might be tested later on. The paper from *H. flavescens* is ink-proof, and has a good rattle and strength, and is what we call 'normal hide-bound' paper.

"The mean bursting strain, corrected to a thickness of 0·1 milligrams (= a substance of 84 grams per sq. metre), was 49 lbs. to the sq. in., and the mean breaking length 6·35 kilometres. This may be described as a strong paper, very much resembling that obtained from *H. coronarium* under similar circumstances."

Buchu.—Buchu is an important drug for which there is usually a steady demand in the English market. The leaves of three species of *Barosma*, viz., *B. betulina*, *B. serratifolia*, and *B. crenulata*, erect shrubs indigenous to South Africa, are generally recognised in commerce, but the first-mentioned species is alone officinal in the British Pharmacopoeia. They have a characteristic penetrating odour, and a strongly aromatic taste, and though the leaves of several allied genera are occasionally offered as Buchu, the peculiar properties of the true drug render the detection of the substitute comparatively easy.

The following particulars on the Production and Protection of Buchu, in the Union of South Africa, are taken from the "Report of the Chief Conservator of Forests for the 15 months' period ending 31st March, 1913," a copy of which has recently been received at Kew. The following figures show the Buchu exports and value during the past six years:—

1907 ...	...	291,334 lbs., valued at ...	... £9,201
1908 ...	...	243,472 ,, ,, ...	... 7,284
1909 ...	...	260,126 ,, ,, ...	... 9,666
1910 ...	...	273,325 ,, ,, ...	... 24,428
1911 ...	...	212,082 ,, ,, ...	... 29,647
1912 ...	...	223,021 ,, ,, ...	... 38,264

and the highest price paid in London during 1912 was 6s. 6d. per lb. for best selected clean green leaf of the *Barosma betulina* variety. It is understood that the demand for this medicinal herb, which is only found in the Western Districts of the Cape Province, is steadily increasing.

The following shows the ports of export for 1912, and the declared value on export:—

Cape Town ...	...	221,338 lbs., valued at ...	£38,166
Port Elizabeth	...	51 ,, ,, ...	2
Mossel Bay ...	...	1,632 ,, ,, ...	96
		223,021 lbs.	£38,264

Based on the declared value the average price per lb. works out to 3s. 5·18d. before leaving South Africa.

The Department during 1912 raised the price of Buchu (*Barosma serratifolia*) in Forest Reserve and Crown land areas in the Swellendam Division from 2d. to 6d. per lb., and at the same time divided up the areas so as to enable close seasons to be maintained over some so as to allow the shrub to rest, recuperate, and shed seed before plucking is next allowed on the area.

On the Cedarberg, where the *Barosma betulina*, the most valuable of the Buchu, grows, the price was raised from 1s. 6d. to 2s. 6d. per lb., and that reserve was divided into four Buchu areas,

only one of which is allowed to be harvested over each year. During the fifteen months' period under review, two areas were dealt with—one in January, 1912, and the other in January, 1913, and the yield was as follows:—

1912 Area (No. 3), 39,119 lbs. at 1s. 6d. per lb. ...	£2,933	18	6
1913 Area (No. 4), 23,972 lbs. at 2s. 6d. per lb. ...	2,996	10	0
63,091 lbs.	£5,930	8	6

The Department is indebted to the Police generally, and the Clanwilliam Police particularly, for assisting Forest Officers in the suppression of Buchu thefts.

Private individuals are beginning to see that the Government Buchu areas, in consequence of being worked in a systematic and judicious manner, are realising a handsome revenue to the State, and there are evidences that private individuals, on whose farms the shrub is found, are making attempts to foster its growth and protect it from the devastating veld fires so common in many districts at certain seasons of the year."

At the last Drug-Auctions held in Mincing Lane on the 28th May, 23 bales of Buchu were offered, the prices ranging from 2s. 2d. to 5s. 2d. per lb. according to quality.

Some further information on the Buchus appeared in *Kew Bulletin*, 1912, p. 326. J. M. H.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the *Bulletin*:—

Mr. T. W. Adams, Greendale, New Zealand.—Cones of *Pinus tuberculata.*

Professor C. S. Sargent, F.L.S., Arnold Arboretum, U.S.A.—Fruits of *Zizyphus sativa* from China.

Mr. John Christie, Mark Lane, London, E.C.—Photomicrographs of stem of *Bambusa vulgaris* and of fibre of *Broussonetia papyrifera.*

Mr. E. N. Kent, Hemel Hempstead. Six specimens of fancy woods as used for making brush-backs.

Major Sir E. Grogan, Bart., Santiago, Chile.—Plants of Yareta (*Azorella* sp.), Mount Tacora, Andes.

Mr. A. G. Campbell, Richmond, Surrey.—Photograph of Gebang Palm (*Corypha Gebanga*), Java.

Mr. T. Burbidge, Chiswick.—Sample of oak from River Moksha, Russia.

Mr. W. R. Price, Pen Moel, Chepstow.—Collection of woods, fibres, fabrics, etc., from Formosa and Loochoo Islands.

Conservator of Forests, Nairobi, British East Africa.—Fifteen specimens of indigenous timbers.

Mr. W. P. Ellmore, Leicester.—Twelve bundles of willow rods as used for basket and chair-making.

J. M. H.

Botanical Magazine for June.—The plants figured are *Hypericum Ascyron*, Linn. (t. 8557); *Vitis Thunbergii*, Sieb. and Zucc. (t. 8558); *Deutzia mollis*, Duthie (t. 8559); *Tricyrtis stolonifera*, Matsumura (t. 8560), and *Stapelia Leendertziae*, N. E. Brown (t. 8561).

One of the finest of the St. John's Worts in the very large-flowered form of *Hypericum Ascyron*, which has been raised at Kew from seed obtained in Korea and presented by Mr. M. L. de Vilmorin. Its erect stems reach a height of 3 or 4 feet, and produce in July and August terminal corymbs of deep yellow flowers which often exceed 4 inches in diameter. In the ordinary form the flowers are from 2 to $2\frac{1}{2}$ inches across. The species is widely distributed in North America and in Temperate Asia, and has been cultivated in this country since 1774.

The publication of a figure of the true *Vitis Thunbergii* provides means for distinguishing this plant from another which, though quite distinct, is repeatedly met with in living collections under the name of *V. Thunbergii*, but which is really a very fine form of *V. Coignetiae*, Pulliat. The plant now figured has much smaller deeply lobed leaves. It is a native of China and Japan, and though quite hardy at Kew, it does not grow so vigorously here as in the garden of Canon Ellacombe, at Bitton, near Bristol, whence the material for the illustration was obtained.

Deutzia mollis has been introduced from Central China by Messrs. James Veitch and Sons, in whose nurseries at Coombe Wood the plant which supplied the material for the figure was grown. It is a distinct and striking species, easily recognised among the Deutzias in cultivation by the soft felt-like indumentum especially of the under-surface of the leaves. At Kew the plant is subject to injury from late spring frosts.

The *Tricyrtis* is a native of Formosa, where seeds were collected by Mr. H. J. Elwes and Mr. W. R. Price. Some of these were presented to Kew by Mr. Elwes, and a plant raised from them provided the specimen figured. The genus belongs to the *Liliaceae*, and includes about ten species, which are distributed from Japan and Formosa to the Central and Eastern Himalaya. The wild plants of *T. stolonifera* observed in Formosa, where the species is found at altitudes of about 7000 feet, were only about a foot high, but the plants at Kew, grown in a cool house, reached a height of two feet.

Stapelia Leendertziae is a remarkable species. Instead of having a flat saucer-shaped corolla characteristic of the genus, this species has an elongated campanulate corolla, the tube of which is 2 to $2\frac{1}{2}$ inches long and $1\frac{3}{4}$ to $2\frac{1}{4}$ inches across. In *S. nobilis*, figured at t. 7771 of the Botanical Magazine, there is also a distinct corolla-tube, but it is much shorter than in the species now illustrated, which was discovered near Heidelberg in the Transvaal by Miss R. Leendertz, now Mrs. R. Pott, by whom a plant has been sent to Kew, where it has flowered. The figure was prepared from a plant which flowered in the garden of Mr. W. E. Ledger, of Wimbledon, in August, 1912.

Botanical Magazine for July.—The plants figured are *Gongora grossa*, Reichb. f. (t. 8562); *Kolkwitzia amabilis*, Graebn. (t. 8563); *Primula vinciflora*, Franch. (t. 8564); *Trollius chinensis*, Bunge (t. 8565), and *Rosa corymbulosa*, Rolfe (t. 8566).

The *Gongora* is a remarkable species from Ecuador. First described in 1877 from a plant which flowered in the garden of the late Sir Charles Strickland at Hildenley, Malton, Yorkshire, it appears to have been lost to cultivation till recently, when a plant was presented to the Kew collection by Mr. Walter Fox, who met with it at Tenqual in Ecuador, growing on a Cocoa tree. Flowers were produced in May, 1913, and afforded facilities for preparing the figure. The species is extraordinary in the large size of its leaves and pseudobulbs, and strikingly attractive in its long elegant racemes.

Kolkwitzia is a monotypic genus of *Caprifoliaceae*, closely allied to *Abelia*, differing in having the flowers in pairs and usually united, so that one receptacle appears to arise from the base of the other. It is probably more interesting botanically than horticulturally. Its flowers are obliquely tubular-campanulate, about $\frac{1}{2}$ inch long, and are white, flushed with rose-pink, and the strongly ribbed nut-like fruits sometimes have the ribs produced above as short horns, which are densely clothed with bristly hairs. The plant is a native of Central China, and has been introduced by Messrs. James Veitch and Sons, in whose nurseries at Coombe Wood it first flowered in June, 1910, and again in June, 1913, when Messrs. Veitch supplied the material for the figure.

Among the many species of *Primula* which, during recent years, have been introduced into our gardens from China and Northern India is the one now figured under the name of *P. vinciflora*, seeds of which were collected in South-Western China by Mr. G. Forrest, and sent to Messrs. Bees, Limited. It belongs to a small group characterised by having large solitary flowers borne on robust scapes, which rise from a sheath of later developing leaves; by having the calyx divided to the base into 5–8 segments, and by having flat seeds with a winged aril. The last-named character induced Mr. Franchet to separate the species from *Primula*, and to form with them his genus *Omphalogramma*. Professor Bayley Balfour, to whom Kew is indebted for the plant figured, has drawn attention to a peculiarity in the stamens of *P. vinciflora*. Those on the posterior side of the corolla are erect, but those on the anterior side are bent across the tube, so that all the anthers are brought together in a cone at the back of the flower. At Kew the species thrives in a cool frame.

Trollius chinensis has often been regarded as merely a form of *T. asiaticus*, Linn., while Mr. Komarov reduces it to *T. Ledebourii*, Reichb. From the latter, to which it appears to be most closely allied, it may be distinguished by having more numerous sepals. It thrives under the same conditions as those found suitable for the common Globe Flower, *T. europaeus*, Linn. The figure was prepared from material obtained from a plant introduced from North China by Messrs. James Veitch and Sons through their collector Mr. W. Purdom.

The Rose is an ally of *R. macrophylla*, Lindl., from which it may be distinguished by the absence of spines when mature, and by the many small flowers which are borne in cormybs towards the ends of the branches. As is the case with the three preceding plants figured in this issue of the Botanical Magazine, *Rosa corymbulosa* is a native of China. The Kew plants were raised from seeds collected by Mr. E. H. Wilson, and presented by Professor Sargent of the Arnold Arboretum.

Notes on Cottons.—Interest in the genus *Gossypium* has been stimulated by the publication of Watt's "Wild and cultivated cotton plants of the world," and numerous specimens have been received lately at Kew for identification.

Excellent material of two native Nigerian races of cotton, "Ishan" and "Meko," has been communicated by Mr. W. H. Johnson, Director of Agriculture, Nigeria. "Ishan" proved to be *Gossypium vitifolium*, Lam., and "Meko" *G. peruvianum*, Cav.

A fine series of specimens of "Cauto" cotton have been received from Mr. W. Harris, Superintendent of Public Gardens and Plantations, Jamaica. Mr. Harris writes under date March 3rd:—"This is said to be a 'tree cotton,' I suppose a large shrub really, and is apparently found in a wild or semi-wild state in the Cauto district of south-eastern Cuba. Our plants are only six months old from seed, and have not yet attained their full dimensions, but they are now bushes up to ten feet high. The plant is a perennial, and, according to our present information, is likely to prove of considerable agricultural value for cultivation in dry districts in the tropics. We have about two acres at Hope, and there are a good many acres at present under trial in various parts of the arid southern districts. We are now passing through a very severe drought, having had scarcely any rain since the beginning of last December, and yet the cotton bushes are in excellent condition and producing crops estimated to yield at least 1200 lbs. of seed-cotton per acre, and as this cotton has been sold at prices varying from 18 to 20 cents. per lb. in the American markets, you will see that it is a plant of much promise for lands that are now producing nothing but scrub. The President of the Cauto Cotton Company, who is now in Jamaica, tells me that he has had enquiries for twenty million dollars worth of this cotton, which appears to be used to some extent for adulterating wool for the manufacture of cheap woollen goods, for which there is an enormous demand." The following notes accompanied the specimens:—"A large shrubby perennial plant. Petals convolute, the margins undulate, pale lemon-yellow, the base of a slightly darker shade. As they grow older the outer and upper portions of the petals become slightly streaked and flushed with purple-rose. The flowers do not fully expand, and present the appearance of being semi-double."

The specimens sent agree in most of their technical characters with *Gossypium brasiliense*, Macf., from which they differ, however, in the seeds being free from one another. In view of the

statement that Cauto cotton is wild or semi-wild in south-eastern Cuba, it may possibly represent the wild stock of *G. brasiliense*; and having regard to its close agreement with that species, apart from the free seeds, it has been provisionally named *Gossypium brasiliense*, var. *apospermum*, Sprague (var. nov.), as it seems desirable to have a definite name for such an important economic plant. At the same time the possibility of its being a hybrid of *G. brasiliense* with some other species cannot be entirely excluded.

The study of its behaviour under cultivation may perhaps throw some light on this point.

Well-prepared material of an interesting wild cotton from Canouan, St. Vincent, West Indies, collected by Mr. F. Birkinshaw, has been received from Mr. W. N. Sands, Agricultural Superintendent, St. Vincent. Mr. Birkinshaw's notes are as follows:—

"*Gossypium* sp. found growing wild on the cliffs above Billy Hole, near Point de Jour, Canouan. The plant is of rather straggly growth, from about $3\frac{1}{2}$ to 5 feet in height. Bolls about 1·5 cm. in length. Bracts 3 cm. long. Capsule usually 4-celled. From descriptions in Watt, 'Wild and Cultivated Cotton Plants of the World,' it appears to be very close to *G. punctatum*, var. *jamaica*."

The Canouan wild cotton is *G. punctatum*, var. *jamaica*, Watt, as suggested. The same variety has been collected recently in Jamaica by Mr. W. Harris (Flora Jamaicensis 10179, distributed as *G. hirsutum*, Linn.), on the coast line between Portland Point and Rocky Point.

Mr. Birkinshaw also collected material of three other cottons, cultivated in Union Island, St. Vincent. Of these, "Carriacou Marie Galante" is either *G. peruvianum*, Cav., or a hybrid with that species; whilst "Ordinary Marie Galante" and "Silk Cotton Marie Galante" are both forms of *G. barbadense*, Linn.

T. A. S.

Siberian Yellow Pine.—Timber merchants are constantly on the look out for new sources of lumber, and at the present time attention is being paid to the forests of Eastern Siberia, Manchuria and Korea, from whence a good class of pine wood, equal in quality to yellow and red pine of North Europe, and Canadian yellow pine, is procured. During the last two or three years several experimental cargoes have been brought to European ports, where the timber appears to have created a good impression, although the heavy freight charges incidental to its 12,000 miles journey are a serious handicap in its competition with European and North American pine woods. A Liverpool merchant gives the freight charges per standard of Canadian pine to Liverpool as about £2 2s. 6d., whereas the charges per standard from Eastern Siberian ports is about £7 10s. In its favour is the fact that larger timber can be procured, at the present time, from the Far East than from the readily accessible European and North American forests, imported logs of Siberian pine being from 18 to 23 feet long, whereas Canadian pine logs are often less than 16 feet in length. The difference in the cost of freight would appear, how-

ever, to outweigh the margin of profit that would be likely to occur from the larger timber, or by the cheaper price of felling and handling of the Asiatic kind.

Siberian yellow pine is the timber of *Pinus koraiensis*, a large tree growing up to 150 feet high in Eastern Siberia, Korea, Manchuria, etc. It belongs to the five-leaved group of the genus, and is recognised by its cylindrical, resinous winter buds, by the pubescent bark of the young wood, its dark green leaves $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long, each with two glaucous lines running the full length, and by its cylindrical cones which are from 5 to 7 inches long with stalks an inch or so in length. The scales of the cones are large and prominent, and the basal ones are recurved. It has been grown in English gardens since 1861, the date of its original introduction by Mr. J. G. Veitch. It does not, however, take kindly to our gardens, and few fine specimens are known.

W. D.

Queensland Nut (*Macadamia ternifolia*).—This is an edible nut produced by a small Proteaceous tree with dense foliage, found in Queensland and in the northern part of New South Wales. The fruit consists of a two-valved fleshy exocarp, the shell being globular, smooth, shining, thick and woody, often exceeding one inch in diameter. The kernels are described as of excellent flavour, somewhat resembling, but superior to, that of the Filbert, and to be much relished by Europeans and Aborigines alike. To the latter the nuts are known as "Kendal-kendal," being valued as a nutritious article of food. Though the tree is of small dimensions, the reddish-coloured, fine-grained wood is used for cask-staves, cabinet work, veneers, shingles and bullock yokes. The tree appears to be little known outside the Australian Continent, therefore its cultivation in other tropical or sub-tropical countries would doubtless be worth a trial. It may be noted that in its native habitat timber-getters are under restrictions with regard to felling the trees.

J. M. H.

Thunderstorms at Kew.—On two occasions within a month of each other, in May and June last, two Atlas cedars in Kew were struck by lightning. On the first occasion, the evening of May 22nd, one of the tall Atlas cedars forming the avenue from the Pagoda to the south-west end of the Lake was struck and its bark torn off in a curious spiral, the rupture encircling the trunk three or four times. Some of the bark was thrown thirty to forty yards away. During the same storm three flag-stones in the paved path that surrounds the iron fence of the Japanese Gateway (which stands not far from the cedar) were lifted from the ground—one of them turned completely over. The cedar struck on the second occasion stands in the Rose Garden. The bark of this tree was also partially peeled off, but the injury was not so great as in the case of the tree struck during the earlier storm.

W. J. B.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6] [1914

XXXV.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

(With Plates.)

XVIII.—NEW RHODODENDRONS.

Rhododendron auriculatum, *Hemsley.*

In some respects this is one of the most remarkable of the new Chinese rhododendrons. It was discovered by Henry in Hupeh about twenty-five years ago, and he notes that it grew 20 to 30 ft. high. Wilson introduced it in 1901 for Messrs. Veitch, from whose nursery at Coombe Wood it has been distributed. It is remarkable for its late growth and flower. At Kew it never starts to grow until July, and Wilson collected it in flower in China during August. The finest plants in cultivation are at Caerhays and some of them were carrying flowerbuds last spring. On our young plants at Kew the leaves are very large, in fact the largest on any of the species that can be grown outside here, being occasionally over 1 ft. long and 4 to 5 ins. wide. They are oblong, with two auricles at the base, hairy beneath (especially when young and near the midrib), of leathery texture. Young shoots, petioles and pedicels bristly. Flowers pale rose, funnel-shaped, 3 to 4 ins. deep, scarcely so wide, six to eight in a truss. Corolla seven-lobed, bristly outside; stamens about fourteen, with glabrous filaments; style exserted, glandular. Fruit very large, $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. thick. The scales that accompany the young growth are glandular and of a lurid crimson.

Although the foliage probably will not be of such striking size when the plants are fully grown, the species is worth growing for this and its late flowers. It may also prove useful to hybridisers in developing a later-flowering race of rhododendrons than any we have.

Rhododendron crassum, *Franchet.*

Originally found by Delavay in Yunnan nearly thirty years ago, this species was first introduced to cultivation by Mr. G. Forrest for Mr. Bulley. It has recently flowered with Mr. E.

(3343.) Wt. 225–595. 1,125. 8/14. J. T. & S. **G. 14.**

Magor, of Lamellen, Cornwall, who kindly sent specimens to Kew. According to Forrest, who found it in shady, moist situations on the eastern flank of the Tali Range, Western Yunnan, at 11,000-12,000 ft. altitude, it is a shrub 15 to 20 ft. high. Young stems stout, scaly. Leaves $2\frac{1}{2}$ to 6 ins. long, 1 to 2 ins. wide, oval or narrowly obovate, coriaceous, dark glossy green and wrinkled above, rather glaucous beneath, but thickly sown with shining brown scales; petiole fleshy, very scaly, up to 1 in long. Flowers in a terminal cluster of four to seven; corolla funnel-shaped, 3 ins. long, five-lobed (the lobes ovate-orbicular), creamy white to rosy white, fleshy in texture, scaly outside. Stamens up to 20, included in the corolla. Ovary and style scaly, the latter 2 to $2\frac{1}{2}$ ins. long. Calyx five-lobed; lobes ovate or elliptical, reaching almost to the base, rounded at the apex, $\frac{1}{2}$ in. long, almost transparent; peduncle thick, $\frac{1}{2}$ to $\frac{3}{4}$ in. long.

R. crassum is undoubtedly very closely allied to *R. Maddeni*, and is probably no more than a geographical form of that species. The chief distinction appears to be in the lobes of the calyx, which are larger and broader than in *R. Maddeni*, although equalled in length by those of the Manipur form of the species—*R. Maddeni* var. *obtusifolium*. It will probably be hardier.

Rhododendron Hanceanum, *Hemsley.*

This species first flowered at Kew in May, 1913, and has flowered in several collections during the past spring. The plants that have blossomed are mostly about 1 ft. high, but Wilson found it on Mount Omi, in Western China, 10 ft. high. The plant is glabrous, except that the leaves are freely sprinkled beneath with small scales. Leaves clustered at the end of the shoot, very unequal in size, narrowly oval or obovate, varying from 1 to 4 ins. long and from $\frac{1}{4}$ to $1\frac{1}{2}$ ins. wide; they are dark green above, paler beneath, and of a peculiarly hard, leathery texture. Flowers borne in a terminal cluster, sometimes very numerous, sometimes only six to ten, but then larger. The funnel-shaped corolla is $\frac{1}{2}$ to $\frac{3}{4}$ in. long, deeply five-lobed, and varies in colour from creamy white to clear yellow. Calyx-lobes oblong, $\frac{3}{16}$ to $\frac{1}{4}$ in. long, ciliate and slightly scaly; stamens ten, white, downy at the base, anthers brown; ovary scaly; style glabrous, exserted.

The Rev. Ernest Faber appears to have first collected this rhododendron on Mount Omi at 4000 ft. altitude about 1886, but the plants in cultivation were raised from seed sent home by Wilson in 1909. It seems to be very hardy, and likely to prove a useful addition to flowering evergreens, although perhaps not a very showy one.

Rhododendron longistylum, *Rehder & Wilson.*

Raised from seeds collected by Wilson in 1908, and sent to Kew from the Arnold Arboretum, plants of this new species flowered at Kew for the first time last spring. According to the collector it is a shrub varying from 2 to 6 ft. in height, and inhabits scrub-clad slopes in Western Szechuen, where it is fully exposed to the sun. Its young shoots are glabrous and sparsely lepidote, and bear leaves over their whole length. Leaves leathery, oval, oblong, or obovate, 1 to 2 ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide.

RHODODENDRON HANCEANUM.

To face page 202.

RHODODENDRON MOUPINENSE.

To face page 203.]

acute, tapering at the base to a stout petiole $\frac{1}{8}$ to $\frac{1}{4}$ in. long; upper surface dark dull green, glabrous, finely reticulated with minute sunken veins; lower surface paler, dull, sparsely lepidote. Flowers white, produced in March in a terminal cluster of as many as twenty. Corolla $\frac{3}{4}$ in. long, funnel-shaped at the base, spreading at the mouth into five ovate lobes, and measuring $\frac{3}{4}$ in. across. Calyx green, 5-lobed, the lobes about $\frac{1}{12}$ in. long, ovate. Stamens ten, 1 in. long, much protruded beyond the corolla, filaments white, downy at the base; anthers yellow; style $1\frac{1}{8}$ in. long, glabrous. Calyx and pedicels scaly, the latter $\frac{1}{3}$ to $\frac{2}{3}$ in. long.

The species is allied to *R. micranthum*, but the flowers are larger and prettier, and remarkable for the length of the much exserted style.

Rhododendron lutescens, *Franchet.*

Originally discovered by the Abbé David in Mupin, Western China, about 1870, this species does not appear to have reached cultivation until Wilson introduced it in 1904. It is of interest as one of the few yellow-flowered, evergreen rhododendrons, but like most of the other species in cultivation with yellow flowers its hue is pale and ineffective. Leaves lanceolate, slenderly acuminate, up to $3\frac{1}{2}$ ins. long, lepidote on both surfaces but especially beneath. Flowers pale yellow, borne singly in the leaf-axils at and near the end of the shoot. Corolla broadly funnel-shaped, 1 in. wide. Calyx minute, scaly; stamens ten, protruded, hairy near the base; ovary lepidote; seed-vessel and pedicels both $\frac{1}{2}$ in. long, lepidote.

This species appears to be widely spread in Western China, and perhaps varies in hardiness. All the plants that have flowered in cultivation are of Wilson's introduction, but those of the Harvard Expeditions appear to be hardier than those of 1904, introduced for Messrs. Veitch.

Rhododendron moupinense, *Franchet.*

Seeds of this pretty and distinct species were collected by Wilson in China in 1908, and several plants raised from them flowered in 1913 and 1914. At Kew it flowered very prettily last March, at which time was made the photograph reproduced in the accompanying plate. According to Wilson, it is an epiphyte, and is often found growing on evergreen oaks and other broad-leaved trees.

A shrub up to 3 or 4 ft. high, young shoots at first pubescent. The leaves are very leathery, ovate, obovate, or oval, rounded or slightly cordate at the base, rounded and mucronate at the apex, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, about half as wide, glabrous on the upper surface except that the midrib is slightly pubescent, densely covered with minute scales beneath; petiole $\frac{1}{8}$ to $\frac{1}{4}$ in. long, pubescent. Flowers apparently rarely more than three in a cluster, the widely funnel-shaped, five-lobed corolla $2\frac{1}{2}$ ins. across, of a pure, glistening white with wine-coloured spots on the upper side. Calyx-lobes shallow, rounded, ciliate; stamens ten, pubescent near the base, anthers chocolate-coloured; style exserted.

Wilson found this rhododendron in several parts of Western

Szechuen up to altitudes of 8000 ft. It is apparently quite hardy, and, from its neat close habit, should be useful for the rock garden.

Rhododendron quinquefolium, *Bisset & S. Moore.*

In its foliage this is one of the most distinct and striking of the *Azalea* group of *Rhododendron.* It is a low, deciduous shrub, probably never much more than 3 ft. high, its bifurcating branches stiff, slender, quite glabrous, bearing the leaves nearly always in terminal clusters of five radiating from a common centre, the largest being obovate, $1\frac{1}{2}$ to 2 ins. long, the smallest one-third the size. They are minutely ciliate and the midrib beneath has, when young, a band of pubescence on each side, reduced later quite to the base. In the young state the beauty of the young leaves is enhanced by their tender green having a purplish margin. Flowers solitary or in pairs produced from the terminal bud along with the new shoots about the end of April. Corolla white or pinkish with yellowish spots on the upper side, five-lobed, broadly funnel-shaped, about 2 ins. wide. Calyx five-lobed, the lobes small, triangular, ciliate; stamens ten, hairy at the base, ovary and style glabrous; pedicel $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long.

Hitherto this rhododendron has blossomed too sparingly to count for much as a flowering shrub, but its foliage is very attractive. Plants raised from seed, presented by Lord Redesdale in 1896, flowered at Kew last spring.

Rhododendron rotundifolium, *David* [*R. orbiculare*, Dene].

Wilson introduced this well marked species during his second journey to Western China in 1904. It was originally discovered by the Abbé David more than twenty years before, and both Henry and Pratt collected it. It is one of the rarest of Chinese rhododendrons in cultivation, the finest examples being in Mr. J. C. Williams' collection at Caerhays Castle. These, when I saw them last April, were low, rather hemispherical bushes about 5 ft. through, set with a few flower buds, and in perfect health. There are three healthy, small plants at Kew, but the species is evidently better adapted for the milder counties. It has stout branchlets, glaucous and minutely glandular when young. Leaves 2 to 4 ins. long, sometimes nearly orbicular, but usually not so wide as long; they are rounded, with a small mucro at the apex, cordate at the base with a very narrow sinus, the auricles sometimes slightly overlapping, glabrous, dull green above, glaucous beneath; petiole, $1\frac{1}{2}$ to $2\frac{1}{4}$ ins. long. Flowers in a terminal truss of about eight to ten. Corolla widely campanulate, 2 ins. across, rosy red, seven-lobed; calyx small; stamens fourteen, included, their filaments smooth; style glabrous; ovary slightly glandular; pedicels up to $2\frac{1}{2}$ ins. long, glabrous.

In its nearly orbicular foliage, *R. rotundifolium* is very distinct, the species most resembling it in this respect being *R. Souliei* and *R. Thomsoni,* but both these are very distinct in having large calyces.

Rhododendron Souliei, *Franchet.*

A bush attaining in a wild state a height of 12 ft.; young branchlets glandular and rather viscid. Leaves roundish-ovate to orbicular, mucronate at the apex and cordate to truncate at the base, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, 1 to $2\frac{1}{4}$ ins. wide, glaucous (especially beneath), glabrous; petiole $\frac{1}{2}$ to 1 in. long, glandular when young. Flowers about five or six in a terminal cluster. Corolla very open, almost saucer-shaped, of a beautiful soft shade of rose, 2 to $2\frac{1}{2}$ ins. wide, five-lobed; calyx distinctly five-lobed, the lobes oblong, blunt, $\frac{1}{4}$ in. long, edged with minute glands; stamens about ten, much shorter than the corolla is wide; style glandular.

This very pretty species flowered with Messrs. Veitch in 1909, only five years after seeds had been sent home by Wilson. It flowered at Kew last May and a year previously, and is very well marked by its shallow corolla and the row of tiny dark glands regularly set on the exact margin of the calyx lobes. Plants obtained from Messrs. Veitch in 1908 are thriving very well.

Rhododendron Williamsianum, *Rehder & Wilson.*

This rhododendron, which was named and described last year in *Plantae Wilsonianae*, vol. i, p. 538, and of which Wilson sent home seeds in 1909, has not yet flowered under cultivation. The collector describes it as a pretty and distinct plant growing 4 to 5 ft. high. The young shoots are very slender, glaucous, and rather thinly furnished with gland-tipped bristles. Leaves orbicular to ovate, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long and wide, apiculate, rounded to cordate at the base, glaucous and rather conspicuously net-veined beneath; petiole up to $\frac{1}{2}$ in. long, purplish when young and glandular-bristly. Flowers three to five in a terminal cluster, opening in June in a wild state. Corolla campanulate, five-lobed, $1\frac{1}{4}$ ins. long, $1\frac{1}{2}$ ins. wide, glabrous, described as of a pale rose and unspotted; calyx small, obscurely lobed and, like the pedicels (which are $\frac{3}{4}$ in. long) covered with glandular bristles; stamens 10, with smooth filaments; ovary glandular.

From its allies, the closest of which are apparently R. Souliei (easily distinguished by its larger calyx) and *R. rotundifolium* (distinguished by its larger leaves and seven-lobed corolla), this species differs most markedly in its slender, almost twiggy branchlets, diffuse branching, and the glandular-bristly character of its young shoots, petioles and pedicels. It was found by Wilson in Western Szechuen at 9000 to 10,000 ft. altitude, and will, in all probability, be hardy.

XXXVI.—DECADES KEWENSES

PLANTARUM NOVARUM IN HORTI REGII CONSERVATUM.

DECAS LXXX.

791. **Dianthus (Caryophyllastrum) tenuis,** *F. N. Williams* [Caryophyllaceae]; affinis *D. nitido,* Waldst. et Kit., caule unifloro, foliis patentibus, bracteis calycinis 5 mm. longis, floribus albis odoratis, discrepans.

Herba caespitosa, laete viridis, glabra, omnino tenuis, habitu subalpino. *Rhizoma* verticale vel parum obliquum, turiones foliosos multos haud dense aggregatos et caules floriferos paucos edens. *Turiones* 9–10 cm. longi, internodiis abbreviatis. *Caulis* circiter 20 cm. altus, tenuis, strictus, erectus, teres, uniflorus, internodiis folia duplo superantibus. *Folia* patentia, stricta, anguste linearia, acuminata, leviter uninervia, vaginam versus supra canaliculato-sulcata, vagina laminae diametrum aequante, basalia (turionum) 3·3–5 cm. longa, caulina consimilia, decrescentia, ima basi margine serrulato-scabra. *Flores* albi, grate odorati, 2·2 cm. diametro. *Bracteae calcyinae* 4, 5 mm. longae, 4–5 mm. latae, ovatae, cuspidatae, adpressae, herbaceae, paribus vix aequalibus. *Calyx* 1·6 cm. longus, in parte purpureo-suffusus, basin versus obscure nervoso-striatus, apicem versus haud attenuatus, dentibus lanceolatis acuminatis basi quincuncialiter se segentibus 7-nerviis margine anguste scariosis. *Petala* contigua, fauce immaculata, parce barbulata, barbellis albis incrassatis discretis; lamina 1 cm. longa, subrhombea, irregulariter grosseque dentata, venis 7 obscuris percursa, in unguem longiorem (1·4 cm.) abrupte attenuata. *Gynophorum* 3 mm. longum. *Ovarium* 7 mm. longum; columella placentalis 5·5 mm. longa, nitido-lucens, lutescenti-viridula, superne attenuata, ovula circiter 30 gerens.

Described from a living plant grown at Kew from seeds received under the name *D. Tenorei* from a nurseryman, in 1894. It is possible that its habitat is a subalpine locality in Italy.

The specific name is chosen from its uniformly slender habit, which applies equally to the stem, to the leaves, and to the calyx-tube.

The name *D. Tenorei* is unknown, and there is no indication in the habit of the plant of its being of cultivated garden origin. *D. tenuis* belongs to the section *Barbulatum* of the subgenus *Caryophyllastrum*, and seems to be allied to *D. nitidus*, *D. microchelus*, and *D. caesius*, but is quite different from any one of the three. The plant cannot be placed with any example of the European material of the genus in the Kew Herbarium. The associated characters which seem to mark it off from any other species are—the bearded white coarsely dentate petals, the short herbaceous cuspidate calycine bracts, and the bright green patent leaves. As to its land of origin, the only clue is the association of the specific name on the label *D. Tenorei* with that of the Italian botanist Tenore.

792. **Derris Lacei,** *Dunn* [Leguminosae-Dalbergieae]; *D. ellipticae*, Benth., facie approximat sed vexillo ecalloso et legumine glabro distat.

Frutex alte scandens, cortice rugoso, ramis lenticellatis. *Folia* 4 (–5)-juga, 22–26 cm. longa, petiolo 4–5-plo longiora, rachi glabra; stipulae caducae, 3 mm. longae; foliola superiora lateralia oblongo-lanceolata, apice abrupte vel sensim caudata, basi rotundata vel cuneata, chartacea, glabra, 8–9 cm. longa, venis marginem appropinquantibus 7–8-paribus utrinque inconspicuis; petioli 4 mm. longi; stipellae caducissimae. *Paniculae* racemi-

formes, pendulae, ex axillis foliorum delapsorum Martio florentes, 20–30 cm. longae, pedunculo brevi, rachi ut ramulis pedicellis calycibusque tenuiter ferruginea; nodi floriferi 1–4-flori. *Flores* laxi 2·2–2·4 cm. longi; pedicelli calycibus sesquilongiores; bracteae minutae; bracteolae 2, paullo infra florem. *Calyx* campanulatus, 5 mm. longus; dentes 2 superiores breves, fere coaliti, 3 inferiores triangulares, 1·5 mm. longi. *Petala* dilute rubida; vexilli lamina ovata, basi subcordata et ecallosa, glabra, reflexa, itaque in floribus pendulis erecta, marginibus revolutis; alae anguste oblongae, basi oblique truncatae; carinae petala alis paullo adhaerentes. *Stamina* monadelpha, vexillari prope basin soluto. *Ovarium* sessile, lineare, multi-ovulatum. *Legumen* lineare (5–) 10 (–20) cm. longum, 2 cm. latum, in latere seminifero ala 2–3 mm. lata, latere altero ala ad 1 mm. lata marginatum, valvis chartaceis glabris paullo reticulatis.

Burma. Maymyo Plateau, 1200 m., *Lace* 5278, 6115.

A not uncommon *Wistaria*-like climber on trees along the banks of streams. When in full flower before the foliage appears, it is a very beautiful object, with its drooping panicles of large pink flowers.

793. **Millettia subpalmata,** *Dunn* [Leguminosae-Galegeae]; species a congeribus foliis subpalmatis distincta.

Frutex vagans vel alte scandens, cortice conspicue lenticellato. *Folia* (1–) 2-juga, subpalmata, 40–60 cm. longa, petiolo 2–3-plo longiora, rachi glabra; stipulae 1 cm. longae; foliola superiora lateralia ovata, apice obtusa, basi obtuse cuneata, papyracea, supra glabra, subtus pubescentia, 20–30 cm. longa; petioluli 8 mm. longi; stipellae non visae. *Paniculae* axillares, parvae? *Flores* non visi. *Ovarium* 7-ovulatum. *Legumen* lineare, 12–18 cm. longum, 2·5–3·5 cm. latum, compressum, valvis lignosis elastice dehiscentibus dense molliter velutinis. *Semina* 4, lenticularia.

Burma. Pegu, Anigdon-kun Reserve, 100 m., *Lace* 6104.

794. **Millettia utilis,** *Dunn* [Leguminosae-Galegeae]; *M. pendulae*, Benth., affinis, floris vexillo ecalloso partibusque omnibus magis pubescentibus diversa.

Arbor magna, cortice laevi pallide brunneo. *Folia* 30–40 cm. longa, petiolo 4-plo longiora, rachi dense pubescente; stipulae ovatae, deciduae, 4 mm. longae; foliola bijuga, superiora lateralia late lanceolata, sensim acuminata, basi breviter acuminata, 14–17 cm. longa, chartacea, supra tenuiter, subtus dense molliter pubescentia, venis marginem approximantibus circiter 8-paribus; petioli 6–7 mm. longi; stipellae setaceae, 2–3 mm. longae. *Paniculae* racemiformes, erectae, terminales et laterales, 10–20 cm. longae, rachi pedicellis calycibusque dense breviter pubescentibus; nodi multiflori, 2–3 mm. longi. *Flores* congesti, 1–1·1 cm. longi; pedicelli 4–5 mm. longi; bracteae bracteolaeque minutae, deciduae. *Calyx* campanulatus, 5 mm. longus, dentibus triangularibus tubo bis brevioribus. *Petala* albo-flavida; vexilli lamina rotundata, basi subcordata, ecallosa; alae oblongae, basi truncatae, carinae paullo adhaerentes; carinae petala ovata, falcata. *Stamina* paullo perigyna, mona-

delpha, vexillari basi soluto. *Discus* nullus. *Ovarium* lineare, sericeum, 5-ovulatum. *Legumen* ignotum.

India. Burma: Pegu; Wunpeiu Reserve 150 m., *Lace* 6101.

Lace notes, "a tree 60 to 70 ft. high, attaining a girth of 8 ft. 6 in. (measured) at breast height. In mixed forest consisting chiefly of teak, pyinkada (*Xylia Kerrii*, Craib et Hutchinson) and bamboos. Wood used for handles of implements."

795. **Cotyledon paraguayensis,** *N. E. Brown* [Crassulaceae]; ex affinitate *C. californicae*, Baker, sed caulescens, foliis cuneato-obovatis, pedunculo ebracteato, corolla alba et staminibus reflexis facile distinguitur.

Herba succulenta, breviter caulescens. *Caulis* 1 cm. crassus, glaber. *Folia* alterna, conferta, superioribus rosulatis, sessilia, 4–7 cm. longa, prope apicem 2·5–4 cm. lata, cuneato-obovata, apice rotundata, brevissime cuspidata, glabra, pallide viridia, purpureo-tincta, glauca, nitida. *Pedunculi* ex axillis foliorum inferiorum enati, subhorizontaliter patuli, 5 cm. longi, nudi, glauci, apice cymoso-bifurcati, ramis 2–4·5 cm. longis simplicibus vel bifurcatis. *Bracteae* 5–8 mm. longae, 2·5–3 mm. latae, lanceolatae, acutae, supra planae, subtus valde convexae, adpressae, glabrae. *Pedicelli* 5–6 mm. longi, patuli, glabri. *Sepala* 5 mm. longa, 2·5 mm. lata, lanceolata, acuta, erecta, glabra, viridia, glauca. *Corolla* 1·5 cm. diametro; tubus 4 mm. longus, campanulatus, haud angulatus, pallide virescens; lobi 7 mm. longi, 3·5 mm. lati, valde patuli, ovato-lanceolati, acuti, plani, supra canaliculati, dorso obtuse subcarinati, albi, basi et margine minutissime purpureo-punctati. *Stamina* 10, primum erecta, demum recurvato-reflexa; filamenta alba; antherae rubrae. *Carpella* 5, leviter rubescentia.

Paraguay. Without precise locality, *F. Weinberg*.

Described from a living plant which flowered at Kew in April, 1914.

When the flower first opens, and during the shedding of the white pollen the stamens are erect, and the immature stigmas are closely connivent and not papillate. At about the third day the stamens become strongly recurved, or almost revolute, so that any remaining pollen is quite out of the reach of visiting insects and cannot be shed upon the stigmas, which now stand well apart and erect, with well developed whitish papillae.

796. **Sedum rariflorum,** *N. E. Brown* [Crassulaceae]; affinis *S. algido*, Ledeb., sed floribus laxissimis, sepalis patulis et petalis acuminatis aristato-apiculatis bene differt.

Herba perennis, succulenta. *Radix* crassa. *Caules* numerosi, annui, decumbentes, ad 15 cm. longi, 1·5 mm. crassi, glabri, apice laxe 2–3 ramosi; ramuli uniflori, laxe 4–5-foliati. *Folia* alterna, patula, 1·5–3·5 cm. longa, 2–2·5 mm. lata, linearia, acuta, supra plana, subtus leviter convexa, glabra, viridia, haud glauca. *Pedicelli* 0·3–1 cm. longi, glabri. *Sepala* patula, apice recurva, 5–7 mm. longa, linearia, acuta, glabra, viridia. *Petala* 5, libera, erecta, apice recurva, 1–1·1 cm. longa, 4 mm. lata, oblongo-lanceolata, acuminata, aristato-apiculata, glabra, alba. *Stamina*

10, petalis multo breviora, filamentis albidis, antheris rubris. *Carpella* erecta, staminibus subaequilonga, pallide virescentia.

China. Chihli: Hsiao Wutai Shan, 3000 m., *F. N. Meyer*.

Described from a living plant, sent by Mr. F. N. Meyer of the American Legation, Pekin, to Kew, where it flowered in June, 1914.

797. **Myrtus taxifolia,** *Ridley* [Myrtaceae-Myrteae]; *M. flavidae*, Stapf, affinis sed foliis multo angustioribus, innovationibus magis lanuginosis, floribus minoribus differt.

Frutex, ramis validulis apice simul ac foliis juvenilibus calycibusque dense lanuginosis. *Folia* lanceolata, apice obtusa, basi rotundata, 11 mm. longa, 2 mm. lata, coriacea, sicca atro-brunnea, superne laevia, polita, adulta glabra, costa supra depressa subtus cum nervis omnino obscura. *Flores* gemini, axillares, pedicellis brevissimis cum calycibus albo-lanuginosis. *Calyx* 3 mm. longus, tubo ovoideo, lobis 4 ovatis acutis utrinque lanuginosis. *Stamina* circiter 30. *Stylus* crassus, cylindricus, 5 mm. longus, stigmate minuto.

Borneo. Sarawak: Gunong Rumput, *J. Anderson* 188.

798. **Anaphalis Bournei,** *Fyson* [Compositae-Inuloideae]; *A. brevifoliae*, DC., arcte affinis sed foliis angustioribus longioribus, ramulis haud tam arcte adpressis et inflorescentiam prope magis distantibus differt; ab *A. neilgherriana*, DC., capitulis majoribus, indumento compactiore recedit.

Caulis fruticosus, inferne copiose ramosus, basi foliis marcidis reflexis tectus, simul ac partes reliquae plantae lana alba adpressa obtectus. *Folia* lineari-oblonga, acuta, 0·6–1·2 cm. longa, 1–2 mm. lata, in ramulis novellis inter se circiter 1 mm. distantia, primo erecta, mox divaricata, demum reflexa, in ramulis floriferis apicem versus magis distantia, internodiis supremis usque ad 1·5 cm. longis, costa conspicua, margine primo insigniter involuto. *Capitula* 1 cm. diametro, ramulis 18–22 cm. longis gracilibus gesta; involucri bracteae ovatae, acutae; receptaculum 3 mm. diametro, foveolatum.

South India. Pulney Hills, very common on the downs in dry and rocky places forming rounded humps like *A. Beddomei* and *A. travancorica*, *Bourne* 2696, *Fyson*. Nilgiri Hills, Kotagiri, *Wight*, K.D. 1630, Courtallam, *Wight*. Anamally Hills, *Wight*, K.D. 1630.

799. **Rhododendron Andersonii,** *Ridley* [Ericaceae-Rhodoreae]; inter species tubifloras *R. malayano*, Jack, affinis sed omnino majus, foliis rigide coriaceis latioribus recedit.

Frutex, ramis validulis, innovationibus lepidotis. *Folia* lanceolata, apice acuminata, acuta, basi cuneata, obtusa, 7–11 cm. longa, 1·5–4·5 cm. lata, rigide coriacea, supra glabra, laevia, nervis lateralibus utrinque 10–12 irregularibus pagina superiore depressis inferiore elevatis costaque prominente, dense lepidota, lepidibus orbicularibus in medio punctatis, petiolo crassiusculo 1 cm. longo suffulta. *Flores* 8, terminales, umbellati, bracteis pallidis subamplexicaulibus; pedicelli graciles, 1·5 cm. longi, lepidoti. *Calyx* discoideus, margine undulatus. *Corolla* tubulosa, 2·5 cm. longa, lobis obovatis rotundatis 1 cm. longis 7 mm. latis.

Stamina 10, glabra, corollae loborum medium vix superantia. *Stylus* cum ovario 2 cm. longus, lepidotus, haud pubescens; stigma parvum, obconicum.

Borneo. Sarawak: Gunong Rumput; *J. Anderson* 179.

The flowers appear to have been dark red.

800. **Echium Perezii,** *Sprague* [Boraginaceae-Borageae]; affine *E. Wildpretii*, H. H. W. Pearson, a quo thyrso laxo, cymis elongatis conspicue pedunculatis pedunculis bracteas aequantibus vel superantibus, corolla pallidiore, styli ramis longioribus, foliorum lamina usque ad basin decurrente distinguitur.

Planta erecta, circiter 2 m. alta. *Folia* iis *E. Wildpretii* similia, sed lamina usque ad basin decurrente, nervis lateralibus inferioribus costae subparallelis. *Thyrsus* laxus; cymae patulae, primum 7–8 cm. longae, sub fructu usque ad 35 cm. longae. *Corolla* dilute rosea. *Styli* rami circiter 1·8 mm. longi. *Nuculae* 2·8 mm. longae, 2·5 mm. latae, tuberculatae, rostro patulo.

Canary Islands. Palma: Punta Llana; Barranco del Agua. Nutlets of this species were collected by a goatherd for Dr. Elias Santos, who sent them to Dr. G. V. Perez of Tenerife. Plants raised from these nutlets flowered at Orotava during June-September, 1913, and were recognised as representing an undescribed species by Dr. Perez, who has sent notes, photographs, dried specimens and nutlets to Kew, where two plants flowered in June, 1914. The new species has been named in recognition of Dr. Perez's services to Canarian Botany generally, and to the study of the genus *Echium* in particular.

XXXVII.—NEW ORCHIDS; DECADE 42.

411. **Pleurothallis (Apodae caespitosae) Lankesteri,** *Rolfe;* affinis *P. myrianthae*, Lehm. et Kränzl., labello obovato-oblongo et atropurpureo differt.

Herba epiphytica, dense caespitosa, pusilla, circiter 6 cm. alta, caulibus secundariis subobsoletis. *Folia* petiolata; limbus elliptico-oblongus, minute tridenticulatus, 2–3 cm. longus, 7–9 mm. latus; petioli 1·5–2 cm. longi. *Racemi* fasciculati, breves, vix 1 cm. longi, multiflori. *Bracteae* distichae, subimbricatae, ovatae, acutae, concavae, 1 mm. longae. *Pedicelli* 3–4 mm. longi. *Flores* minuti. *Sepala* subpatentia, ovata, subacuta, 1·5 mm. longa; lateralia libera. *Petala* lanceolata, acuta, 1·5 mm. longa. *Labellum* obovato-oblongum, obtusum, carnosum, minutissime papillosum, 1 mm. longum. *Columna* lata, 0·5 mm. longa; stelidia late oblonga, patentia.

Costa Rica. Near Cachi, *E. Lankester.*

Flowered at Kew in June, 1914. It is very distinct from most others of the section, and closely resembles the Guatemalan *P. myriantha*, Lehm. et Kränzl., in habit, but differs in the shape and colour of the lip. It is very inconspicuous, owing to the fact that the small flowers are borne in fascicles below the leaves. The flowers are deep yellow, with the lip and column dark purple.

412. **Microstylis Andersonii,** *Ridley*; herba *M. bancanae*, Ridley, affinis, labello oblongo, lobo terminali bifido, fovea nulla distincta.

Caulis adscendens, 7–14 cm. longus. *Folia* herbacea, lanceolata, acuminata, basi angustata, obliqua, 13 cm. longa, 4 cm. lata vel minora, 5-nervia; petiolus 1·5 cm. longus. *Scapus* gracilis, 19 cm. longus, basi (11 cm.) nudus. *Racemus* laxus, pauciflorus. *Bracteae* lanceolatae, acutae, deflexae, 2 mm. longae; pedicelli graciles, 3 mm. longi. *Flores* parvi, pallidi, 3 mm. longi. *Sepalum* posticum lanceolatum, cymbiforme, acutum; lateralia latiora, breviora, obtusa. *Petala* lateralia oblongo-linearia, obtusa, angusta. *Labellum* oblongum, quadratum, lobo terminali ovato bifido, lobis lateralibus incurvis brevibus, auriculis majusculis falcatis lanceolatis obtusis, fovea nulla, nervis in medio elevatis. *Columna* subelongata, stelidiis prominulis erectis obtusis, anthera brevi lata reniformi.

Borneo. Sarawak: Bau, *J. W. Anderson* 42.

413. **Sarcopodium suberectum,** *Ridley; S. acuminato,* Rolfe, affine, sed minus, labelli epichilio subcarnoso, carinis rugosis pubescentibus, foliis multo minoribus ellipticis obtusis valde coriaceis.

Caulis adscendens, ramosus, validulus, lignosus, 16 cm. altus, radicibus longis crassis. *Peudobulbi* conici, 4-angulati, obtusi, 3 cm. longi, sicco ad basem 1 cm. diametro. *Folia* elliptico-lanceolata, apice obtusa, minute inaequaliter biloba, basi angustata, 4·5 cm. longa, 1·5 cm. lata, rigide coriacea, polita, supra tenuiter striata, subtus laevia, carinata, petiolo 1 cm. longo suffulta. *Racemus* flexuosus, 8 cm. longus, floribus 4; bracteae oblongo-lanceolatae, obtusae, 4 mm. longae; pedicelli graciles, 1·7 cm. longi. *Sepala* lanceolata, acuminata, lateralia mentum breve 5 mm. latum obtusum formantia, 1·7 cm. longa, 6-nervia. *Petala* lanceolata, acuminata, acuta, fere aequilonga, 6-nervia. *Labellum* trilobum, 1·5 cm. longum, lobis lateralibus oblongis apice rotundatis, epichilio ovato-lanceolato acuto subcarnoso, carinis 2 ad basem elevatis et incurvis nectarium tubiforme formantibus, in epichilio carinis undulatis rugosis pubescentibus. *Columna* elongata, ad pedis apicem alata, ventrice tristriata clinandrio profundo margine trilobo lobis subtriangularibus, antheris sterilibus 2, mediana fertili conica. *Capsula* subgracilis, cylindrica, 2·5 cm. longa, columna terminata.

Borneo. Sarawak: Gunong Rumput, *J. W. Anderson* 172.

The column in the only flower in good condition has two rudimentary anthers attached to processes of the margin of the clinandrium just as in *Dendrobium pandaneti*, Ridley. This may be an accidental monstrosity or a normal occurrence as in the last-mentioned plant.

414. **Coelogyne annamensis,** *Rolfe*; affinis *C. brunneae*, Lindl., sed pseudobulbis fusiformibus, floribus minoribus, et labello inaequaliter tricarinato differt.

Pseudobulbi crasse fusiformes vel fusiformi-oblongi, circiter 9 cm. longi, 3 cm. lati, leviter sulcati, diphylli. *Folia* breviter petiolata, elliptico-oblonga, acuta, subundulata, 5-nervia, 20 cm. longa, 5·5 cm. lata. *Scapus* arcuatus, circiter 25 cm. longus, 8-florus. *Bracteae* elliptico-oblongae vel ovato-oblongae, valde concavae, 2·5–3·5 cm. longae. *Pedicelli* 1·5–2·5 cm. longi.

Sepalum posticum elliptico-oblongum, subobtusum, concavum, incurvum, 3·5 cm. longum, 1·4 cm. latum; sepala lateralia oblonga, subacuta, carinata, subpatentia, 2·5–3 cm. longa, 1 cm. lata. *Petala* linearia, acuta, recurva, circiter 3 cm. longa. *Labellum* trilobum, recurvum, 2·5 cm. longum; lobi laterales oblongi, obtusi vel subobtusi; lobus intermedius obovatus vel orbiculari-obovatus, obtusus, 1·5 cm. latus; discus obtuse tricarinatus, carinis nanis laevibus valde inaequalibus. *Columna* incurva, clavata, 2 cm. longa.

Annam.

Flowered in the Royal Botanic Garden, Glasnevin, in November, 1913, when it was sent to Kew for determination with the record that it was obtained from Messrs. Sander and Sons, in June, 1912. It is a member of the small group *Fuscescentes*, but is distinct from the species already known. The sepals and petals are pale buff yellow, and the lip rather darker, with irregular radiating brown nerves on the side lobes, some orange-brown on the lower part of the front lobe, and flesh-coloured keels.

415. **Eulophia Lambii,** *Rolfe; E. Kirkii*, Rolfe, simillima, sed labello latiore et ob discum prominenter 5-carinatum prope apicem cristato differt.

Folia oblongo-lanceolata, acuminata, plicata, membranacea, 5-nervia, 13–17 cm. longa, 1·5–3 cm. lata. *Scapi* 20–30 cm. alti, vaginis spathaceis acutis 3·5–4 cm. longis obtecti; racemi 9–11 cm. longi, compacti, multiflori. *Bracteae* lineari-lanceolatae, acuminatissimae, circiter 2 cm. longae. *Pedicelli* 1–1·3 cm. longi. *Flores* mediocres. *Sepala* subpatentia, oblongo-lanceolata, acuta, brunnea, 1·7–2 cm. longa. *Petala* suberecta, ovato-oblonga, obtusa, flava, circiter 1·5 cm. longa. *Labellum* trilobum, 1·2 cm. longum, 1 cm. latum; lobi laterales oblongi, obtusi, subundulati; lobus intermedius orbiculari-oblongus, obtusus, valde undulatus; discus prominenter 5-carinatus, carinis basi verruculosis apice elevatis incrassatis et cristatis; calcar conico-oblongum, obtusum, incurvum, 3 mm. longum. *Columna* clavata, 7 mm. longa.

Tropical Africa. Northern Nigeria: Bauchi Plateau, *P. H. Lamb.*

This species closely resembles the Eastern *E. Kirkii*, Rolfe, in general appearance, but is markedly different in the details of the lip. It is dedicated to Mr. P. H. Lamb, Director of Agriculture in Northern Nigeria, who collected it together with other interesting plants.

416. **Eulophia pusilla,** *Rolfe;* ab *E. Milnei*, Reichb. f., calcare oblongo et labello aequilongo valde differt.

Folia non vidi. *Scapi* erecti, subgraciles, 30–37 cm. alti, basi vaginis tubulosis obtecti; racemi 5–7 cm. longi, sublaxiflori, multiflori. *Bracteae* oblongo-lanceolatae, breviter acuminatae, concavae, 3 mm. longae. *Pedicelli* subgraciles, 6 mm. longi. *Flores* parvi. *Sepala* subpatentia, circiter 5 mm. longa; posticum elliptico-oblongum, subacutum; lateralia oblongo-lanceolata, subacuta. *Petala* elliptico-oblonga, subacuta, 4–5 mm. longa. *Labellum* trilobum, 3·5 mm. longum; lobi laterales semioblongi,

angulati vel subtruncati; lobus intermedius rotundatus, obtusus, crenulatus; discus crebre papilloso-cristatus; calcar oblongum, subobtusum, 4 mm. longum. *Columna* oblonga, 2·5 mm. longa.

Tropical Africa. Gold Coast Colony: Eastern Province; open country on Afram Plains, *K. G. Burbridge* 245.

The plant is said to grow on dry poor soil, exposed to full sunshine, and the flowers are white, tinged with yellow.

417. **Maxillaria Fletcheriana,** *Rolfe;* a *M. Hubschii*, Reichb. f., partibus omnibus fere duplo majoribus et floribus purpureo-striatis differt.

Pseudobulbi ovoideo-oblongi, subcompressi, 3–5 cm. longi, apice monophylli, basi diphylli. *Folia* petiolata; limbus oblongus vel elliptico-oblongus, subacutus, 15–20 cm. longus, 4·5–5·5 cm. latus; petioli 8–12 cm. longi, vaginis late conduplicatis. *Scapi* 30–32 cm. longi, vaginis oblongo-lanceolatis acutis conduplicatis imbricatis obtecti. *Bracteae* elliptico-lanceolatae, acutae, subconduplicatae, 5·5–6 cm. longae. *Pedicelli* 5 cm. longi. *Flores* speciosi. *Sepalum* posticum ovatum, subacutum, obtuse carinatum, concavum, 4 cm. longum, 2·2 cm. latum; sepala lateralia oblique triangularia, subacuta, 3 mm. lata, apice subrecurva, basi in mentum obtusum subincurvum 4 mm. longum extensa. *Petala* elliptico-ovata, breviter acuminata, basi incurva, apice recurva, 3 cm. longa, 1·5 cm. lata. *Labellum* recurvum, elliptico-obovatum, trilobum, 4–5 cm. longum; lobi laterales obtusissimi, erecti; lobus intermedius suborbicularis, obtusus, undulatus, 1·5 cm. latus; callus obovato-oblongus, obtusus, crasse carnosus. *Columna* crassissima, 1·5 cm. longa, pede 4 cm. longo.

Peru. *L. Forget.*

Introduced by Messrs. Sander and Sons, and flowered in their establishment at St. Albans in April, 1913, when it received an Award of Merit from the Royal Horticultural Society. The sepals are white, with a few irregular purple lines, the petals more strongly lined, and the lip yellow in front with a few purple dots, the crest yellow, and the side lobes suffused and lined with red-purple.

418. **Renanthera pulchella,** *Rolfe*; a *R. Imschootiana*, Rolfe, floribus duplo minoribus, labelli lobo intermedio orbiculari-ovato et colore florum differt.

Herba epiphytica, circiter 18 cm. alta. *Folia* disticha, anguste oblonga, apice breviter biloba, coriacea, 6·5–8 cm. longa, 1·5–2 cm. lata. *Scapi* patentes, circiter 18 cm. longi, parce ramosi. *Bracteae* ovatae, obtusae, concavae, 3 mm. longae. *Pedicelli* circiter 1 cm. longi. *Flores* mediocres. *Sepalum* posticum oblongo-lanceolatum, obtusum, 1·3 cm. longum; sepala lateralia spatulata; limbus elliptico-oblongus, obtusus, subundulatus, 1·3 cm. longus, 8 mm. latus; unguis 4 mm. longus. *Petala* subspatulato-oblonga, obtusa, 8 mm. longa. *Labellum* trilobum, 5 mm. longum; lobi laterales triangulares, obtusi, subcarnosi, 2 mm. longi et lati; lobus intermedius ovato-orbicularis, 4 mm. latus, basi prominenter quadridentatus. *Columna* lata, brevissima.

Burma.

Flowered in the establishment of MM. A. A. Peeters et Cie, Brussels, in August, 1913. A single plant appeared in an importation of *R. Imschootiana*, Rolfe, to which it bears a general resemblance in habit, but the flowers are only about half as large and markedly different in structure. The colour is yellow with the side lobes of the lip and upper half of the petals crimson.

419. **Angraecum birrimense,** *Rolfe*; ab *A. Eichleriano*, Kränzl., floribus minoribus, labello angustiore et calcare recto differt.

Herba epiphytica. *Caulis* subelongatus. *Folia* disticha, oblonga vel elliptico-oblonga, oblique bidentata, 10–13 cm. longa, 2·5–3·5 cm. lata. *Scapos* non vidi. *Flores* speciosi. *Pedicelli* 3·5 cm. longi. *Sepala* et *petala* subpatentia, lineari-lanceolata, acuminata, 3–3·5 cm. longa, 5–8 mm. lata. *Labellum* obovatum, apice triangulari-acuminatum, 2·5 cm. longum et latum; calcar leviter curvatum, 3·5 cm. longum, basi infundibulare, deinde subconstrictum et subclavato-cylindricum. *Columna* latissima, 4 mm. longa; pollinarii glandula squamiformis.

Tropical Africa. Gold Coast: Birrim District, in dense forest, *A. G. Miles*.

A living plant and a somewhat imperfect dried specimen were sent to Kew, and the latter is now in the collection. Although near to *A. Eichlerianum*, Kränzl., the lip is not broadly dilated at the sides, and the upper part of the spur is narrower and less obliquely bent about the middle than in that species.

420. **Disa (Eudisa) nigerica,** *Rolfe*; habitu *D. saxicolae*, Schlechter, sed sepalo postico patente, calcare apice incurvato-clavato, et labello latiore differt.

Herba terrestris, circiter 22 cm. alta. *Folia* caulescentia, sessilia, oblongo-lanceolata, acuminata, 3–4 cm. longa, circiter 8 mm. lata. *Racemus* circiter 9 cm. longus, sublaxus, multiflorus. *Bracteae* lanceolatae vel oblongo-lanceolatae, acutae, 5–8 mm. longae. *Pedicelli* 0·8–1 cm. longi. *Flores* parvi, purpurei. *Sepalum* posticum patens, ovatum, subacutum, 4 mm. longum; calcar erectum, 7 mm. longum, basi conicum, deinde gracile, apice incurvo-clavatum; sepala lateralia patentia, ovato-oblonga, subacuminata, 6 mm. longa. *Petala* dolabriformia, 3 mm. longa, apice 2 mm. lata. *Labellum* spatulatum, obtusum, integrum, 4 mm. longum, 1·5 mm. latum. *Anthera* reclinata.

Tropical Africa. Northern Nigeria, *R. G. P. Nelson* 5.

Closely resembling *D. saxicola*, Schlechter, in habit, but markedly different in the shape of the dorsal sepal and lip. The flowers are described as purple.

XXXVIII.—WEST INDIAN BOXWOOD.

(*Casearia praecox*, Griseb.)

T. A. Sprague and L. A. Boodle.

The botanical identity of the tree yielding the wood known in the trade under the name of West Indian or Venezuelan boxwood

has for a long time been a matter of doubt. Since the year 1910 H.M. Minister at Caracas, Venezuela, and H.M. Consuls at Puerto Cabello and Maracaibo have been unremitting in their efforts to obtain herbarium specimens and corresponding samples of the timber of Venezuelan boxwood on behalf of the Royal Botanic Gardens.

In the year 1911 in reply to our request for specimens of the tree yielding West Indian boxwood H.M. Minister at Caracas kindly forwarded some specimens of wood with the following information supplied by Mr. Vice-Consul Schröder of Maracaibo:—

"The West Indian boxwood is a product of the district of Maracaibo only and therefore exported only from here. If at any time the genuine boxwood has been shipped from Curaçao or Puerto Cabello, it had been originally shipped from Maracaibo. The boxwood is a yellowish hard wood used mostly for turning. It is cut in pieces about two yards long and from 4–8 inches thick. The best time for cutting the wood is during the months of December to June."

Mr. Schröder promised in the course of his despatch to send herbarium specimens in addition to the samples of wood, but it was not until May of this year that specimens of branches with leaves and flowers of the boxwood tree, together with pieces of the wood were received at Kew. Our best thanks are due to H.M. Minister at Caracas for his kind help, and especially to Mr. Vice-Consul Schröder for the keen interest he has taken in this matter.

The Tree.—The abundant supply of flowering and leafy twigs has enabled the Maracaibo boxwood tree to be identified as *Casearia praecox*, Griseb.,* a species hitherto recorded only from Cuba.

C. praecox has been collected, however, in the district of Santa Marta, Colombia, by Mr. H. H. Smith, No. 789, distributed as "*Casearia ramiflora*, Vahl (?)."

The genus *Casearia* was assigned by Bentham and Hooker† to the family *Samydaceae*, which is merged by Engler and Prantl‡ in the *Flacourtiaceae*. The leaves of most species show pellucid dots and dashes when held up to the light, owing to the presence of secretory cavities in the mesophyll. These cavities are present in the leaves of *C. praecox*, but are rather small, and hardly visible in a dried state owing to the opacity of the leaves, and were overlooked by Grisebach. The sepals of *C. praecox* exhibit refracting dots due to the presence of secretory cavities. According to Eichler§, the sepals are less frequently dotted in species of *Casearia* than the leaves.

The flowers of *Casearia* are apetalous, with 4–6 sepals, and 6–12 stamens alternating with the same number of staminode-like bodies. The latter are considered by some authors as

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* Cat. Pl. Cub. p. 10 (1866).
† Genera Plantarum, vol. i. p. 796.
‡ Nat. Pflanzenfam. vol. iii. 6. A. p. 50.
§ Mart. Fl. Bras. vol. xiii. part 1, p. 458.

staminodes, and by others as disc-processes. The ovary is unilocular with three (rarely two) parietal placentae, and bears a single style.

The genus has been divided into several sections based on the nature of the style and the disc-processes. The section *Crateria*, to which *Casearia praecox* belongs, is characterised by a trifid style with capitate stigmas, and by the disc-processes being free, and inserted in the same circle as the stamens. Three other species of this section are known: one, *C. sylvestris*, Sw., very widely distributed in tropical America, and two, *C. inaequilatera*, Camb., and *C. Selloana*, Eichl., natives of Brazil.

C. praecox may be distinguished by its ash-coloured branches and twigs, leaves hairy on the midrib beneath and without obvious markings in a dried state, and well marked "spurs" (short shoots), which bear the fascicles of flowers. These "spurs" have the shape of a shallow stalked cup, the stalk being much flattened parallel to the branchlet which bears it. Combs, who collected the species in the Cienfuegos district of Cuba, described it as a shrub 2–3 m. high.* In Maracaibo it attains the dimensions of a tree; its height is not stated, but a section of a trunk received from Mr. Schröder is about 25 cm. in diameter.

The bibliography and geographical distribution of *C. praecox* are as follows:—

C. praecox, *Griseb.*, Cat. Pl. Cub. p. 10 (1866); Warb. in Engl. u. Prantl, Nat. Pflanzenfam. vol. iii. 6. a. p. 52; Combs in Trans. Acad. Sc. St. Louis, vol. iii. p. 423.

Cuba. Western part of the island, *Wright* 1889; Matanzas, *Rugel* 206; district of Cienfuegos, in rocky woods, on fertile soil at Cienaguita, fl. Feb., *Combs* 704. Colombia. Santa Marta, 45 m., fl. March, H. H. Smith 789. Venezuela. Maracaibo district, fl. March–April, per *F. J. Schröder*.

The geographical distribution, Cuba and South America, is interesting. It is an additional illustration of Engler's statement that most of the plants common to the West Indies and cisequatorial South America occur on the Greater Antilles.† According to Urban‡ the flora of Puerto Rico exhibits very strong relationships with that of South America; and by far the greatest part of the high mountain flora of Santo Domingo consists half of new species, and half of continental species which occur nowhere in the West Indies except at high levels in Santo Domingo.§

It may be useful to mention some minor differences which have been noticed in the specimens of *C. praecox* from different localities.

Cuba (*Combs* 704). Pedicels 4–5 mm. long; staminodes 0·8 mm. long; style altogether 1 mm. long, the undivided part twice as long as the arms; ovules 13–15; leaves long and gradually acuminate, acute or obtuse at the base.

Venezuela (*Schröder*). Pedicels 4–5 mm. long; staminodes

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* Trans. Acad. Sc. St. Louis, vol. vii. p. 423 (1897).
† Versuch einer Entwicklungsgeschichte der Florengebiete, vol. ii. p. 212.
‡ Symbolae Antillanae, vol. iv. p. 681.
§ Symbolae Antillanae, vol. vi. p. 291.

0·5 mm. long; style altogether 0·6–0·75 mm. long, the undivided part as long as the arms, rarely twice as long; ovules 15–18; leaves long and gradually acuminate, acute, obtuse or rounded at the base.

COLOMBIA (*Smith* 789). Pedicels 7 mm. long; staminodes 0·8 mm. long; style altogether 1·1–1·3 mm. long, the undivided part two to three times as long as the arms; ovules 21–23; leaves shortly acuminate or cuspidate, obtuse or rounded at the base.

It will be seen that the Venezuelan plant has shorter staminodes and style than the Cuban or Colombian specimens, and that it usually has the undivided part of the style no longer than the style-arms. In the length of the pedicels, however, it agrees with Cuban specimens, and in the number of ovules it is intermediate between the Cuban and the Colombian. The shape of the leaves is rather variable. It is evident that, on the characters given above, it is undesirable to separate the Cuban, Venezuelan and Colombian plants, even as distinct varieties.

The Wood.—As the twigs which bore the leaves and flowers were separate from the samples of wood, it was thought advisable to compare the microscopic structure of the twigs with that of the wood-specimens, in case there should have been any mistake on the part of the collector. The result of the comparison is quite satisfactory as regards agreement in structure, and proves that the twigs and wood belong to the same species, or to two closely related species. Under the circumstances they may be accepted as belonging to the same species.

The specimens of wood referred to are a small block and a section of the stem (or short log with bark) about 12 inches in diameter and $2\frac{1}{2}$ inches thick. The wood is close-grained and yellowish, and bears a considerable resemblance to true boxwood. The presence of a secretion in the inner bark (secondary bast) is indicated in the log by a resinous or oily stain on the transverse surface. The secretion has oozed out of the bark, and has then soaked into the peripheral part of the wood, so that the stain extends a short distance (1–3 mm.) on either side of the cambium.

The structure of the wood is as follows. The vessels are small, rounded or elliptical (with greater diameter usually less than 50 μ), solitary or in short radial rows, fairly evenly distributed, and numerous, *e.g.*, 240 to the square millimeter. The perforations of the vessels are simple. The pits between the vessels and the medullary ray-cells are small and bordered, like those on the other parts of the walls of the vessels. The medullary rays are numerous; some are uniseriate, but most are multiseriate, being usually three or sometimes four cells broad in their middle region. Many of the multiseriate rays have an upward or downward uniseriate prolongation of considerable length (as seen in tangential section). The cells in the multiseriate portion are mostly rounded, and 10–15 μ in diameter, while the cells of the uniseriate part are quadrangular, and may measure from 25 to 60 μ by 12 to 18 μ. Solitary crystals of oxalate of lime occur in many of the cells of the uniseriate portions of the rays. The height of some of the medullary rays is rather more than 1 mm.

Wood-parenchyma appears to be quite absent. The wood-fibres have thick walls and simple pits. The length of the fibres averages rather less than 1 mm., and their diameter 15–20 μ.

The bark of the specimen is about 4 mm. thick. The cork-cells are thickened on the inner side, and their cavities become nearly or quite obliterated. The secondary phloem includes secretory canals and stone-cells, but no sclerenchyma-fibres. The secretory canals may reach 50 μ in diameter, but are mostly smaller; they have a distinct thin-walled epithelium, and their contents are soluble in alcohol. The stone-cells in the older parts of the secondary phloem form continuous or nearly continuous zones alternating with soft tissue. In the younger phloem the stone-cells may first appear in rounded groups or tangential bands, which afterwards become united. Numerous cells containing solitary crystals of oxalate of lime become included in the bands of stone-cells.

There seems to be no reason to doubt that the specimens of West Indian Boxwood mentioned above belong to the same species of tree as do the branches bearing flowers and leaves, and should be referred to *Casearia praecox*, Griseb.

Though Solereder* does not mention the occurrence of secretory canals in *Casearia*, or in any other member of the family to which *Casearia* belongs (*i.e.*, *Samydaceae* of Bentham and Hooker, or the corresponding portion of *Flacourtiaceae* of Engler and Prantl), he states that he found secretory cavities in the phloem of one species, viz., *Casearia grandiflora*. Van Tieghem,† moreover, in describing the secretory cavities of the *Samydaceae*, states that in the stem (in *Samyda*) they are more or less strongly elongated, and resemble secretory canals. From these statements it appears probable that the secretory canals found in the specimens under consideration are not altogether exceptional for the *Samydaceae*; at any rate the phloem of one other species of *Casearia*, viz. *C. tomentosa*, Roxb., possesses secretory canals like those of *C. praecox*.

The samples of wood from the Maracaibo district appear to be identical with several specimens of West Indian Boxwood in the museum at Kew. Two of these are pieces prepared for wood-engraving, and presented by Mr. R. J. Scott, of 8, Whitefriars, E.C., one in 1867, the other in 1880. The latter bears a note that the donor reported on this wood: "It is the only likely successor to boxwood I have yet seen." The other specimens are as follows. A block of wood, a rough and a finished stick and handle for a sunshade presented by Messrs. Henry Howell and Co., 180, Old Street, E.C., in 1888; a butter-clapper ("Scotch hand") made at Chesham (Mr. James Howard, Chesham, 1889); a section of the stem from Maracaibo (Messrs. Joshua Gardner and Sons, 1909); two samples of Venezuelan Boxwood sent by H.M. Minister at Caracas in 1912; and a number of specimens illustrating the manufacture of butter-clappers, etc., presented in 1912 by Messrs. Thomas Wright and Sons, Steam Mills, Chesham, where the articles were made.

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* Solereder, Syst. Anat. of Dicotyledons (Eng. edition), vol. I, p. 377.

† Van Tieghem, Canaux Sécréteurs des Plantes, Annales des Sci. Nat. Bot. 7 sér. t. 1, p. 59.

The earlier of these specimens were originally named *Tabebuia pentaphylla*, Hemsl., but the identity of the wood had been regarded as doubtful for some years past.

Wiesner* gives a description of the structure of a West Indian Boxwood, which appears to be the same as the one described here, and therefore the wood of a species of *Casearia*. He, however, gives the botanical name of the tree yielding the wood as *Aspidosperma Vargasii*, DC. on the authority of A. Ernst,† who mentions that the wood is called "Amarilla yema de huevo"‡ in Venezuela. Ernst also refers to the export of the wood from Puerto Cabello to Hamburg, and gives figures showing that the export was considerable in 1878. Wiesner mentions that the wood is used for making shuttles, combs, sticks and measures, but states that it is less suitable for wood-engraving.

Useful wood is yielded by other species of *Casearia*, and in the case of *C. tomentosa*, Roxb. the wood is employed for making combs.§ A specimen in the museum at Kew shows that the grain of this wood is not so close as in West Indian Boxwood, but it is quite possible that there may be two or more species of *Casearia* in America yielding woods that are practically indistinguishable. For the present, however, it may be assumed that the different specimens of West Indian or Venezuelan Boxwood referred to above belong to the same species.

XXXIX.—THE JAPANESE SEAWEED, TOSAKA NORI.

A. D. Cotton.

Some years ago Mr. E. M. Holmes presented to the Herbarium some specimens of an edible Japanese alga which he had received from the late Mr. E. C. C. Stanford. The plant is much esteemed in Japan where it is known as *Tosaka nori* (=Cock's-comb seaweed). The structure of the thallus and cystocarp was plainly that of *Eucheuma*, though the outline of the frond agreed with none of the described species of that genus. Being apparently common in Japan, it was improbable that it had never been named, hence, pending further inquiry, the plant was laid in the Herbarium as *Eucheuma* sp. Mr. Holmes also had been unable to place it under any described species.

Identification and Description.—On the occasion of Professor Yendo's visit to England last winter, the opportunity was taken to ask his opinion. Dr. Yendo's knowledge of the algae of the East is unrivalled, not only from the fact that he has for many years made an exceptionally careful study of the algal vegetation of Japan, but also from the circumstance that he had just com-

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* Wiesner, Die Rohstoffe des Pflanzenreiches, vol. 2, p. 999.

† A. Ernst, Bot. Centralblatt, 1 Jahrg. (1880), p. 59.

‡ The name refers to the colour of the wood, which is supposed to resemble that of the yolk of an egg.

§ Watt, Dict. Econom. Prod. of India.

pleted a two years' tour of the principal herbaria of Europe in order to examine the specimens on which the Japanese species had been founded or recorded. "Tosaka" was familiar enough to Prof. Yendo, who stated that its scientific identity had never been effected in Japan, but that in his "Text Book of Marine Botany" he had provisionally and doubtfully referred the plant to *Meristotheca papulosa*, though it differed materially from the description of that species. During his stay in Europe he had found specimens of the plant in question in many herbaria, and under various names. The examination, however, of the co-types at Dublin and Lund did much to remove the doubt expressed in his text-book, and on returning to the Continent in February, Dr. Yendo wrote that he had clinched the point by an examination of Montagne's original specimen in the Paris Museum. As this is now established, and as it is unlikely that any earlier specific name for the plant will be discovered, the new combination *Eucheuma papulosa* may be formed, the formal description of which is as follows:—

Eucheuma papulosa, Cotton et Yendo, comb. nov., *Callymenia papulosa*, Mont. Pugillus Alg. Yemens No. 21 (Ann. Sci. Nat. ser. 3. t. xiii, 1850, p. 246); J. Ag. Sp. ii. p. 293. *Euhymenia papulosa*, Kütz. Tab. Phyc. xvii. Tab. 73, fig. 2. *Meristotheca papulosa*, J. Ag., Bidrag Fl.Syst. p. 36, partim, excl. syn.; Yendo, Text-book of Marine Botany pp. 622-630, figs. 177 and 178.

Fronds springing from a discoid base, with a short stem soon expanding and dividing into many segments. Total height, 15–20 cm., very irregular in general outline but cordate or reniform when fully developed. Colour when fresh deep rosy brick red. Segments plane, thick and fleshy, 5–8 cm. long, 2–5 cm. wide, irregularly dichotomous: margins at first entire, later giving rise in a pectinate manner to copious proliferating branchlets. Antheridial and cystocarpic plants usually rugulose on the surface. Cystocarps sessile, globose, intermixed with short subulate processes, marginal, or in irregular clusters on surface. Antheridia similar in shape and in position to cystocarps but destitute of subulate outgrowths. Tetraspores scattered all over the frond, imbedded in the epidermal layer, zonately divided, small, 18–20 × 9–10 μ.

Distribution.—Red Sea, Somaliland, Formosa, Japan, Guadeloupe (?), Sandwich Islands.

The external appearance of the plant is extremely variable according to the age and mode of branching. In the simpler forms the frond is flat, dividing into broad linear segments with wide axils; in the more complicated, the general aspect resembles that of *Halymenia formosa*. The surface of the principal segments of sexual plants is usually rugulose and the margin verrucose and irregular owing to the presence of reproductive bodies. The tetrasporic form has a smooth surface and is generally more copiously branched. In some specimens the frond is spotted with deep crimson flecks and in others it is homogenously crimson red. The subulate processes amongst the cystocarps are characteristic of the species, though they occur also in a doubtful ally *E. Schrammii*, J. Ag.

History and Taxonomy.—The original specimen of *Callymenia papulosa* is represented in Montagne's Herbarium at Paris by a tetrasporic plant, but there are co-types at Dublin and Lund which possess cystocarps. It is fortunate that both forms of fruit are available, as it was only by means of these that the true position of the plant could be located. Dr. Yendo found that the structure of the frond and cystocarp of the Dublin specimen was clearly that of a *Eucheuma*. A difficulty, however, existed as to the tetraspores. In *Eucheuma* these are zonate. J. Agardh in 1872 removed *C. papulosa* to his genus *Meristotheca*, a genus which he expressly separates from other members of the *Solieriea*e on the ground of cruciate tetraspores. He gave as a synonym *Halymenia ceylanica*, Harv. and *Callymenia exasperata*, Zan. J. Agardh's material at Lund was examined by Yendo, who reports that he had no doubt that the statement as to the tetraspores was not based on an authentic specimen, but on some other species. Nine specimens so named exist in the Agardhian Herbarium, and they comprise at least three species. In any case, the possession of cruciate tetraspores is negatived by the fact that in the type specimen at Paris the sporangia are zonate. Montagne's species is thus shown to be a typical *Eucheuma*, and from wide experience of the Japanese Tosaka, both in the field and in herbarium, Yendo has no hesitation in referring it to that species. It may be added that specimens from Japan sent by Tanaka to Grunow (now in the herbarium of the Botanical Museum at Berlin) were identified by the latter as *Meristotheca papulosa*, but this fact was never communicated to Japanese algologists.

The subsequent history in the literature of Montagne's plant may be briefly stated. Heydrich, in his paper on New Guinea Algae (Ber. Deut. Bot. Ges. x. p. 477, 1892), takes up Harvey's *Halymenia ceylanica* (Kütz. Tab. Phyc. xvi. Tab. 97) and formed the combination *Sebdenia ceylanica*, Heydr. Under this he places *Meristotheca papulosa* (Mont.) J. Ag., as a synonym, a position in which it unfortunately finds itself in De Toni's Sylloge Algarum. Without re-investigation, which in so vast a work was impossible, it was only natural for De Toni to leave the plant where Heydrich placed it, but it is needless to say that as a *Eucheuma* it has been practically buried. Harvey's *Halymenia ceylanica* is itself a problem, and is probably a composite gathering, but there is no evidence that it is allied to *Eucheuma*.

The following extracts compiled from Prof. Yendo's note-book are worth recording:—

"During my stay in Europe I found the plant treated in a puzzling way and under many diverse names. In addition to finding specimens named *Meristotheca papulosa*, I discovered specimens under:—

Sarcodia Klenzeana (Kütz.) Kjellm.	Hb. St. Petersburg. det. Kjellman.
Callymenia dentata, Kütz.	Hb. Imp. Mus. Tokyo. det. Grunow.
Acanthymenia Harveyana, J. Ag.	Hb. Bot. Mus. Lund. Sandwich specimen only. det. J. Agardh.

Eucheuma Schrammii, J. Ag. Hb. Bot. Mus. Lund. Guadeloupe specimen only. det. J. Agardh.

"The following other more or less doubtful references to the plant occur in the literature or herbaria. A name *Tosakanoria japonica* is mentioned in a list of Japanese plants compiled by K. Saida (1910) without description, but with little doubt proposed for this same plant. Being a *nomen nudum*, however, it is not valid. The alga distributed by Collins, Setchell and Holdens in Phyc. Bor. Amer. No. 745 under *Eucheuma echinocarpum*, Aresch. has some resemblance to Tosaka, but it differs in several particulars. It should be further noted that in the copies of Phyc. Bor. Amer., which I have seen, the Florida plant is distinct from the original *E. echinocarpum* of Areschoug. The alga hinted at as gen.? sp.? in Okamura's Nippon Sorui Mei-i (Enumeration of the Algae of Japan, 1902) certainly refers to our Tosaka. The nearest ally is *Eucheuma Schrammii*, J. Ag., which was originally distributed by Mazé as *Mychodea Schrammii*, Orn. I have examined specimens at Kew, Dublin and Lund, all of which are fragmentary, and though they agree in possessing horned cystocarps it is impossible to say from the specimens whether or not they are identical with *E. papulosa*. The colour and texture do not support such a view."

Habitat and Economic Importance.—The following notes have also been supplied by Prof. Yendo. Tosaka is often collected by divers in a depth of 10–12 fathoms in open coasts in the middle and southern part of the country. Large quantities of the plant are, however, obtained by picking up the floating fronds with scoop-nets after rough weather in early spring. It is found on the Pacific side of Japan up to about 36° N., and is supposed to grow in much deeper water than the above-mentioned depth.

The collected weed is dried in the sun and sold in the markets, where several varieties, according to the colour, substance and shape, are distinguished by dealers. It is prepared into isinglass and is used as food. A certain amount is also exported annually to China where the plant is known as Hong-tsay (crimson-weed).

XL.—THE RINGING OF TREES.

L. A. Boodle.

The injuries sometimes inflicted on trees by squirrels were described a few years ago in the case of young trees of *Thuya* and *Cupressus*, specimens of which had been sent to Kew by Mr. R. B. Rogers, of Hexworthy, Launceston, Cornwall.* The immediate injury is to the bark,† which is stripped off the trunk in places, sometimes on one side, sometimes all round. That is, in the latter case the stem is completely ringed, and an experiment

* A. W. Hill, Conifers damaged by squirrels. New Phytologist, vol. 10, pp. 340–342, Pl. 7.

† The word "bark" is used here for convenience in the vernacular sense to include all the tissues outside the wood (or outside the cambium).

in plant-physiology is the outcome of the squirrels' labour. In the examples referred to the damage had been very severe; long strips of bark had been removed, so that in one case a considerable portion of the trunk appeared as a pole of bare wood with islands of bark upon it. Branches of the stem inserted within some of these islands were still living, and bore healthy foliage, although their isolation by the removal of the bark from around the islands had taken place more than two years previously.

Some further specimens injured in a similar manner have recently been received from the same donor. In one of these the bark had been ringed, and the tree had eventually died, but it was found by examining the annual rings that the part above the wound had lived for at least four years after the ringing-operation. Other specimens examined showed from three to five years' growth above the ring-gap.*

In these cases the wood exposed by the injury is perfectly bare, and of course no new layers of wood have been formed on its surface, as the stripping of the bark involves the removal or death of the cambial layer. The outer layers of the wood exposed to the air soon become dry and useless for conduction, hence it is clear that the older layers of wood must be capable of continued fairly rapid transference upwards of water coming from the roots, as evidenced by the continued life of the parts above the ring-gap. In the case of the specimens previously examined, though some of the branches remained fresh, the water supply had proved insufficient to keep the tops of the trees healthy.

The effect of ringing differs in different kind of trees. Various experiments have been made, and a study of the results of the operation proved useful in the early days of plant physiology in leading to a knowledge of the route of conduction of water and of elaborated food-substances in plants. Experiments in ringing were made by Malpighi and Ray, of whom the latter† mentions that a holly tree lived for several years after a ring of bark of a hand's breadth had been removed from the stem so as to leave the wood bare. Since this early observation numerous experiments have been made on several kinds of trees, and form two classes, viz.:—(1) bark-ringing, *i.e.*, the stripping off of a ring of bark as in the cases mentioned above; and (2) wood-ringing, *i.e.*, making an annular cut into the stem through both bark and part of the wood.

Bark-ringing.—The effects of bark-ringing depend upon the interruption of the bark and the exposure of the wood. The break in the continuity of the bark prevents the normal conduction of elaborated food-substances (albuminous and carbohydrate) from the parts above the ring-gap to those below, since these bodies are ordinarily conveyed through the bark‡ (or more precisely the

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* By this is meant the annular gap in the bark, made by the operation of bark-ringing.

† Ray, Hist. Plant., T. 1, p. 9.

‡ Any conduction of food-substances that may take place through the wood in the downward direction would be against the transpiration current, and might be expected to be slight. That it is slight or non-existent is suggested by the fact that growth in thickness of the stem practically ceases below the ring-gap.

phloem). Hence, if there are no leaf-bearing branches on the stem below the point of ringing, starvation of the roots ensues. This may be slow, seeing that there is a store of food in the bark of the roots and of the base of the trunk to draw upon, but the growth and absorptive powers of the roots will eventually be checked, and in some cases the functional failure of the roots may be the final cause of the death of the tree.

The exposure of the wood, where the bark has been removed, introduces other factors endangering the life of the tree. The supply of water for the upper part of the tree has all to pass through the wood at the level of the ring-gap, and from several causes the conducting power of this wood tends to become more and more curtailed until the requisite amount of water can no longer pass through it. Owing to the surface of the wood being in contact with the air, the outer layers of wood become dry and useless for conduction. This alone may soon render the water-supply insufficient in species with only a thin zone of sapwood, since true heart-wood is incapable of conducting the transpiration stream. On the other hand "sap-wood trees" (*i.e.*, those which form little or no heart-wood) can usually survive the operation of ringing for a long time, *e.g.*, several years. Among these the progressive drying of the wood from without inwards may finally restrict the area of functional wood until it reaches the critical point, or this result may be accelerated by a fungal disease attacking the wood and rendering some of it useless. Again, in trees which form heart-wood, the production of this accounts for the loss of a certain proportion of the wood available for conduction. While no new wood is added at the level of ringing, and functional wood is lost externally by drying, there is a further loss internally owing to the yearly conversion of some sap-wood into heart-wood.

To summarise, bark-ringing eventually causes the death of the upper part of the tree, because the water supply becomes inadequate, either through loss of conductivity in the wood at the level of the wound, or through deficiency of absorption by the roots.

An interesting example of bark-ringing may be quoted here. A forked pine-tree was chosen by Hartig* for an experiment. The tree was 118 years old, and the trunk was forked at $4\frac{1}{2}$ m. above the soil into two approximately equal stems. The bark was peeled off all round one of these stems at about 3 m. above the point of forking. When the tree was felled 18 years after this ringing operation had been performed, it was seen that the crowns of both stems were still sound, but that the foliage of the ringed stem was thinner and weaker than that of the other stem. It was also found that growth in thickness had practically ceased after ringing on the side of the trunk situated below the ringed branch. The reason for the long-continued life of the ringed stem is that the roots attached to the base of the trunk on the side below the intact stem had received normal nourishment, and therefore, having remained healthy, had been able to supply the trunk with a good supply of water.

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* Hartig, Lehrbuch d. Anat. u. Phys. d. Pflanzen, p. 234.

Wood-ringing.—The experiments in wood-ringing made by Strasburger and others* show that, though the inner (older) layers of sap-wood can conduct water for the transpiration current, the heart-wood cannot do so. The first of the following cases serves as an example of a sap-wood tree, the remainder being "heart-wood trees" (*i.e.*, trees which form heart-wood).

Two beech-trees 150 years old had trunks 32 cm. in diameter. These were ring-cut to a depth of 8 cm., and the trees still bore foliage a year and a half later.

The trunk of an oak 50 years old was ring-cut into the heart-wood, and its foliage withered in a few days. Another oak of the same age, which was cut similarly but not quite through the sap-wood, did not wither for some weeks.

The trunk having been cut to the heart-wood in a tree of *Prunus avium*, and in a *Robinia*, wilting of the leaves took place in two days in the first case, and in a few hours in the second.

Various other experiments and observations have been made in bark- and wood-ringing, but enough has been quoted to illustrate the nature of the results obtained in this way.

XLI.—THE BOTANIC GARDEN, UNIVERSITY COLLEGE, CORK.

The following short article on the Botanic Garden of University College, Cork, has been kindly sent by request for publication in the *Bulletin* by Major H. A. Cummins, Professor of Botany and Agriculture in the College. Some photographs of the garden sent with this article have been added to the collection of photographs of Botanic Gardens in the Museums of the Royal Botanic Gardens, Kew.

The University College, Cork, is situated to the West of Cork City. The College was opened in 1849, and up to the establishment of the National University of Ireland in 1908, it was known as the Queen's College.

The original building is in the Collegiate Architectural style of the 15th century.

The existing college grounds comprise a park of about 25 acres, the south branch of the river Lee flowing through the lower part. From the river the land rises, in some parts precipitously to a height of about eighty feet, and the College is situated on the elevated ground. The northern entrance is on the Western road across a bridge spanning the river, and an avenue leads up a gentle slope to the college.

The avenue is bordered on each side by specimen trees and ornamental shrubs. Ascending the avenue, the river and lower grounds are to be seen on the right hand, the latter planted with trees, shrubs, bamboos, and other decorative plants. The central portion has been cleared and tennis courts made for the use of

* Strasburger, Bau und Verrichtungen der Leitungsbahnen (Histolog. Beiträge, 3), p. 515.

the students. The Botanic Garden, Plant Houses, and Biological Laboratory are at the south-east of the grounds, standing in about three acres of land, of which the systematic garden occupies about one and a half acres.

The Biological Laboratory accommodates over fifty students and is directly connected with the Plant Houses.

The Palm House is placed centrally and contains many tropical palms and other plants, of which a few may be mentioned, such as *Brownea* (six species), *Saraca indica* and *Saraca* hybrids obtained from the collection of the late W. H. Crawford, Esq. In the cooler houses are orchids, cacti and other interesting plants. There are some fine specimens of Tree Ferns in a house set apart as a Fernery.

The land for a Botanic Garden was acquired by the College in the year 1877, during the Presidency of the late Dr. W. K. O'Sullivan; the following year the late W. H. Crawford, Esq., offered to defray half the expense of laying out this ground in a suitable manner, and in erecting plant houses.

The Government accepted this offer and contributed the other half of the sum of money required. By the year 1880, the Biological Laboratory, Plant Houses and Botanic Garden were completed.

The original plan of the Systematic Garden being considered unsuitable, Mr. J. Griffin (now Head Gardener) was sent to Kew in 1883, and as a result of his report the present arrangement of flower beds has been fashioned on the design in favour in the Royal Gardens, Kew, at that time.

In the original stocking of the gardens and plant houses, specimens of plants were presented by the National Institutions of Kew, Glasnevin, and by Trinity College, Dublin, and by numerous private persons. Since then the stock has been kept up both by purchase and presentations.

In addition to the systematic garden there are rock-gradens in both the upper and lower grounds, as well as artificial ponds for the cultivation of water lilies; these ponds are useful to students as they form a habitat for many forms of *Algae* as well as of small aquatic animals and *Protista*. Bog plants thrive in an artificial bog, made in a concrete basin, especially built for the purpose. The surroundings of the students' clubs are bedded out with decorative plants; shrubs have been set along the walls in the college quadrangle, and they flower profusely, as the position facing south, enables them to obtain the maximum of sunshine, while buildings provide a shelter from cold winds.

The Herbarium includes a considerable number of species of native plants; the foreign floras are represented by a large collection of American plants.

Indian material is chiefly composed of specimens presented by the Director of the Royal Botanic Gardens, Calcutta.

Mosses, Lichens, and marine Algae are fairly well represented in the Herbarium. Every opportunity is taken of adding to the above collections.

XLII.—MISCELLANEOUS NOTES.

Mr. G. G. Auchinleck, B.Sc., Agricultural Superintendent, Grenada, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Director and Chemist in the Department of Agriculture, Mauritius.

Mr. F. Birkinshaw, Assistant Agricultural Superintendent, St. Vincent (*K. B.* 1912, p. 350), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Instructor of Agriculture in the Department of Agriculture, Mauritius.

Mr. George Farmer has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Agricultural Instructor for the Coast Region of the East Africa Protectorate.

Mr. J. Jarrett, lately a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, a Sub-Inspector for the purposes of the Destructive Insects and Pests Acts under the Board of Agriculture and Fisheries.

Mr. M. B. Scott, M.A., and Mr. W. B. Turrill have been appointed by the President of the Board of Agriculture and Fisheries, on the results of a competitive examination, Assistants in the Royal Botanic Gardens, Kew.

Mr. T. F. Chipp, B.Sc., Assistant Conservator of Forests, Gold Coast (*K. B.* 1910, 132), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Director of Gardens in the Straits Settlements.

Mr. Alfred Redmayne Bell, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of Nigeria.

Retirement of Mr. N. E. Brown.—After forty years' continuous service Mr. Brown retired from the post of first-class Assistant in the Herbarium on July 10th, having reached the age limit. A native of Redhill, and a born naturalist, Mr. Brown's occupation has been the pleasure of his life. Like many others, whose love of nature is an early development, Mr. Brown studied natural history generally in his school days, but entomology was perhaps his favourite pursuit. On leaving school he was appointed Curator of Mr. W. W. Saunders's then well-known museum of

natural history at Reigate. In February, 1873, he entered the Kew Herbarium, and thereafter devoted practically the whole of his time to botany, and especially to the study of the rich flora of South Africa. But his activity has not been limited to taxonomy and descriptive work, though he published little in other branches, and his microscope has always been a source of great enjoyment to him. His knowledge of the distribution of plants has been of great service to the institution and has also been employed in the instruction of many generations of gardeners. In 1879 he received the honour of being elected an Associate of the Linnean Society. The Journal of the Kew Guild for 1904 contains a portrait of Mr. Brown, and an appreciation of his work, more especially in its relation to horticulture; and the *Kew Bulletin* for 1897 and 1907 contains almost complete lists of his very numerous publications. This is not the place for particulars, but his contributions to our knowledge of such difficult groups as the *Asclepiadaceae*, *Araceae*, *Euphorbiae* and *Ericaceae* are models of critical and thorough work. Mr. Brown also possesses a profound knowledge of cultivated succulent plants, but more pressing claims on his time have up to the present prevented him from giving this knowledge full practical development. Of his work generally it may be said that it is finished, so far as materials permitted. The Herbarium contains lasting and invaluable evidence of his industry with pen and pencil, and of his clever preparation of specimens of plants difficult to preserve. He has begrudged no time to complete details, and perfunctoriness is unknown to him. None can surpass him in discovering points of difference as well as points of resemblance. As a colleague he has been always obliging, amiable, and unselfish. His official disappearance from his seat will be regretted by all of his associates, and he leaves with their best wishes for a serene and happy retirement.

W. B. H.

The genus Rosa.*—A copy of this sumptuously illustrated work, which is dedicated to Her Majesty Queen Alexandra, has been presented to the Library of the Royal Botanic Gardens, Kew, by Miss Willmott, F.L.S., V.M.H. The work contains about 132 beautifully coloured plates, drawn from nature by Alfred Parsons, R.A., and 83 uncoloured, the latter representing fruiting specimens or species at present only known from dried specimens. It was issued in twenty-five parts, and is intended to be bound in two volumes. The work contains an Historical Introduction, an illustrated Glossary of terms, and an analytical Key to the classification of the groups, with a comprehensive general Index. The botanical descriptions are by Mr. J. G. Baker, F.R.S., a leading authority on this critical genus. Miss Willmott's book is the outcome of many years' study of Roses, during which a very large collection of species and old garden forms were got together at Warley, but the author has aimed at collecting the evidence from every available source, giving her own opinion as seldom as

* The genus Rosa. By Ellen Willmott, F.L.S. Drawings by Alfred Parsons, R.A. London: John Murray, Albemarle Street, W.

possible. The history of each species is very fully given, especially those which are of horticultural importance, and there is an exhaustive list of references and figures. In a number of cases materials were not available for illustration. The numerous hybrids are also very fully indicated, and in those cases where they have formed the starting point of distinct races of garden Roses, the history, and an illustration are also given. The last number contains a number of Chinese Roses received too late for inclusion in their proper sequence; several of these are new, and others are figured here for the first time. They are partly from Roses communicated by M. Léveillé, and partly from seedlings raised at Warley from seeds collected by Mr. E. H. Wilson, whose travels in China have resulted in several interesting additions to the genus Rosa. Of the beauty and accuracy of the plates it is difficult to speak too highly, and Miss Willmott must be congratulated on the production of a work that will form a landmark in the history of this beautiful and difficult genus. R. A. R.

Poisoning by Sorghum halepense.—Some recent correspondence in the "Indian Forester," vol. xxxix. nos. 6 and 10, upon the value of *Sorghum halepense*, Pers., as a fodder grass, and the danger to cattle and horses which its use entails, shows that the exact nature and reactions of the dangerous constituent are not well understood. There is conclusive evidence that the young vegetative parts of *S. halepense* are, under certain conditions, poisonous to farm animals, and as the plant is, after rice, probably the commonest food and fodder plant in India, besides being much used elsewhere, it has been deemed desirable to publish a short note dealing with the matter.

In 1902 Dunstan and Henry (Phil. Trans. Roy. Soc. A, 199, p. 399), isolated a glucoside, which they called dhurrin, from the leaves of the great millet (*Sorghum vulgare*). This substance was found to have the empirical formula C_{14} H_{17} O_7 N, and on hydrolysis with hot dilute hydrochloric acid or the enzyme emulsin, yielded one molecule each of prussic acid, parahydroxybenzaldehyde, and dextrose.

Sorghum halepense, Pers. (*Andropogon halepensis*, Brot.), is considered by Hackel to be a variety of *S. vulgare*, Pers. (*Andropogon Sorghum*, Brot.), and there is little doubt that dhurrin is found in it as well as in the typical plant. The free prussic acid is the actual substance which causes the death of animals eating the young vegetative parts of *Sorghum*. The enzyme emulsin is present in the parts of the plant containing the glucoside, and when in the early processes of digestion the two come together the emulsin by the addition of water to the dhurrin breaks the latter down and liberates the poisonous prussic acid.

An examination of the numerous records of cases in which *Sorghum* was used for fodder establishes two facts of practical importance. Firstly, the young vegetative parts of the plant are the most dangerous to stock, the mature plant being nearly or quite harmless. Analyses of old plants have shown that little or no prussic acid yielding substance was present. Secondly, the

poisonous effect of the grass is enhanced in times of drought. One writer states that the grass is dangerous only in the green state, and that if the same grass is cut and dried and used for fodder, it has no injurious effect. This may be due to the destruction of the glucoside or the emulsin, or both, by the drying of the grass without their coming into contact with each other, but it is possible that the grass was not cut till near maturity, that is to say after the disappearance of the prussic acid yielding glucoside.

W. B. T.

Derris involuta.—This species has been identified in the Kew Herbarium with *D. oligosperma*, K. Schum. et Lauterb., by Mr. S. T. Dunn, who is preparing a revision of the genus; and the reduction was accepted in Bot. Mag. t. 8530. During a recent visit to Berlin, however, the writer had the opportunity of comparing *D. involuta* with the type of *D. oligosperma*, and the differences then observed led to the conclusion, in which Dr. Harms concurred, that the two species were undoubtedly distinct. The following notes may serve to prevent them from being confused in the future.

Derris oligosperma, *K. Schum. et Lauterb.*

Leaflets cordate at the base, obtuse and very distinctly mucronulate at the apex; midrib and lateral nerves impressed on the upper surface, much raised on the lower; lateral nerves very oblique, the middle ones running for more than half the length of the leaf before curving away from the margin; reticulation not evident on the upper surface.—Native of New Guinea.

Derris involuta, *Sprague.—D. oligosperma*, Bot. Mag. t. 8530. Leaflets obliquely rounded or obtuse at the base, retuse or subtruncate and indistinctly mucronulate at the apex; midrib and lateral nerves slightly raised on the upper surface, rather more raised on the lower; lateral nerves less oblique than in *D. oligosperma*, the middle ones running for less than half the length of the leaf before curving away from the margin; reticulation evident on the upper surface.—Native of Queensland and New South Wales.

The comparison has been confined to the leaves, as the flowers of *D. oligosperma* are still unknown.

T. A. S.

Botanical Magazine for August.—The plants figured are *Cyrtosperma Johnstoni*, N. E. Brown (t. 8567); *Meconopsis rudis*, Prain (t. 8568); *Rosa setipoda*, Hemsl. and E. H. Wils. (t. 8569); *Zingiber Mioga*, Roscoe (t. 8570), and *Cotoneaster Franchetii*, Bois (t. 8571).

The *Cyrtosperma* is an Aroid introduced from the Solomon Islands by the late Mr. William Bull, who distributed it under the name of *Alocasia Johnstoni*. It is a very distinct plant and of considerable ornamental value, with its red-veined, arrow-shaped leaves. Petioles and peduncles are spiny, and the erect spathe, which is about 6 inches long, is dark violet and slightly polished outside, while inside it is dirty whitish-green faintly flushed with

rose. The drawing was prepared from a fine specimen which flowered in the Nepenthes House at Kew in August, 1913.

Meconopsis rudis, a native of Szechuan and Yunnan, Western China, has been introduced into European gardens through Mr. E. H. Wilson and Mr. G. Forrest. The Kew plants which provided material for the figure were raised from seeds collected by the former and presented to the establishment by Professor C. S. Sargent of the Arnold Arboretum. It is a monocarpic herb with a prickly stem, which reaches a height of 3 feet, and raceme-like cymes of sky-blue flowers, sometimes flushed with purple, occasionally entirely pale purple. From its near ally, *M. aculeata*, Royle, it may be easily distinguished by its entire or nearly entire leaves and by its flowers always having more than four petals.

The rose is a native of Hupeh, Central China, and has been introduced into cultivation by Messrs. James Veitch & Sons, in whose nursery at Coombe Wood it flowered last year. It has a general resemblance to *R. macrophylla*, Lindl., and its large corymbs of rose and white flowers are distinctive owing to the numerous foliaceous bracts and the spreading gland-tipped bristles which clothe the long pedicels.

Zingiber Mioga is a Japanese plant which, under the name of "Mioga," is valued in its native country for its aromatic properties. The young inflorescences and leafy shoots are used for flavouring soups and pickles, and as a spice. The drawing was made from material obtained from a plant imported from Japan and presented to Kew by Mr. H. J. Elwes. Its flowers are very pale yellow.

The *Cotoneaster* is an attractive species first introduced by Mr. M. L. de Vilmorin, who received seeds collected in Western China from the Abbé Soulié. Plants were raised at Les Barres, and in 1901 that from which the figure was prepared was presented to Kew by Mr. Vilmorin. It has a graceful habit, with arching elegant branches, and in the autumn, when its rather large orange-red fruits are ripe, it forms a strikingly handsome shrub. It is very hardy and grows freely at Kew.

Fortune's Double Yellow Rose.—A fine flowering specimen of an old historic Rose has been sent by the late Director, Sir William T. Thiselton-Dyer, K.C.M.G., Witcombe, Gloucestershire, with an enquiry as to its botanical origin. A search revealed the fact that although it was figured in the Botanical Magazine in 1852 (t. 4679) there was no specimen in the Herbarium, and that it has been more or less confused with *Rosa Fortuneana*, Lindl. (Paxt. Fl. Gard. ii. p. 71, fig. 171), a hybrid between *R. Banksiae* and *R. laevigata* (for example *R. Fortuneana*, Lem. Jard. Fleur. iv. t. 361 is simply a copy of the Botanical Magazine plate). Hemsley remarks (Journ. Linn. Soc. xxiii. p. 249) that *R. Fortuneana*, Lindl., is probably a hybrid between *R. Banksiae* and *R. indica*. Baker refers Fortune's Double Yellow to *R. chinensis* var. *pseud-indica*, which is regarded as identical with *R. pseud-indica*, Lindl. (Monogr. Ros. p. 132), which was based on a painting of a double yellow Chinese Rose in Lambert's Herbarium, but

this old drawing seems to have been completely lost sight of. Enquiry at the Natural History Museum, South Kensington, the Lindley Herbarium at Cambridge, and the Delessert Herbarium at Geneva (which acquired some of Lambert's specimens), has failed to trace it. Lambert's collections were sold by auction, and it would be interesting to trace the whereabouts of this original drawing. Fortune's Double Yellow also bears the name of Beauty of Glazenwood and *Rosa amabilis*, Germaine de St. Pierre. Crepin (Journ. Roy. Hort. Soc. xi. p. 220) remarks that it seems very probable that it is only a garden variety of *R. gigantea*, but the idea is not borne out by comparison. It is most like a form of the variable *R. indica*, or a variety of it, but the natural limits of this species are so much obscured by hybridisation that it is difficult to form an opinion. At all events there is now dried materials at Kew which will be available for future comparison.

R. A. R.

Mahonia Fortunei and M. confusa.—An enumeration of the Asiatic species of *Mahonia* is given by C. K. Schneider in Sargent, Plantae Wilsonianae, part 3, pp. 378-385, issued May 15th, 1913. To the species there mentioned should be added *M. confusa*, Sprague in *Kew. Bull.* 1912, p. 339 (published September, 1912). This is a species which was confused by Fedde with *M. Fortunei*, from which it may be distinguished by the terminal leaflet being separated from the uppermost pair by an internode of the rhachis, by the larger number of leaflets, which are of a different shape, and by other characters.

Schneider's *Mahonia Fortunei* evidently includes *M. confusa*, as he quotes *Henry* 3117, one of the types of that species. The only other specimen quoted by Schneider as seen by him is *Wilson* 2882 (Arnold Arboretum Expedition). It is doubtful to which species this belongs, as the number is not yet represented in the Kew herbarium.

T. A. S.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7] [1914

XLIII.—JOSEPH CHAMBERLAIN—IN MEMORIAM.

Amongst the tributes of memory called out by the passing of the great statesman Kew cannot be silent. For it owed to him, as to no other of our time, stimulus, encouragement and support. In his beautiful home at Highbury he found recreation in his garden from the labours of a strenuous political life. It was not the mere indulgence of a man of means; as with everything else it bore the impress of his own personality and practical ingenuity. An extensive range of glass was incorporated with the house; no outside pilgrimage was needed to visit it. An ample winter garden was a pleasant meeting ground for the family and its guests. Out of this opened a corridor with houses on either hand. A button by the side of each plate-glass door illuminated at night with electric light the interior display. These may seem trivial details: they are not so; they brought Mr. Chamberlain's favourite pursuits into the intimacy of his life. He took no exercise, nor did he find distraction in sports or games. Yet it was a fundamental principle with him that every man, however absorbed in the main pursuit in life, should find a hobby in something wholly remote from it. The physiological implication is sound; for distraction is rest, though not somnolent. Far from it: Mr. Chamberlain knew his plants; their origin and history were recorded in his garden books with his own hands It may seem a paradox; but the man who could hold a vast meeting spell-bound was perhaps not less happy amongst his plants in a garden apron with a short pipe. Yet the secret is the same; he was above all things human. There have been statesmen in the past whose humanity needed some palliation.

It has been well said that the principle which animated Mr. Chamberlain's public life was desire for the welfare of the people, the nation and the race. As he passed from one field of activity to another that principle simply took a wider scope. In a wholly unofficial way it influenced his interest in Kew. To him, apart from its scientific aspects, it was the national garden. He was jealous that it should be up to the high-water mark of horticultural enterprise. But this requires now and again a generous expenditure possible to a possessor of private means, but not to a

(3401.) Wt. 225–595. 1,125. 9/14. J. T. & S. G. 14.

government establishment. The reason is that the one has a "margin," the other has not. It cannot be complained that Kew, in all essentials, is not liberally maintained; but every item of expenditure is ear-marked, and there is no room for an occasional however judicious extravagance. And this applies equally to other establishments maintained by the State, such as the British Museum and the National Gallery.

Mr. Chamberlain wanted the people to have the enjoyment at Kew of the best that a rich man could afford, and at least in one instance he helped it to circumvent the difficulty. He insisted that Kew should take up the cultivation of the splendid hybrids of *Hippeastrum*. These are costly to buy, and few private gardens can supply the special means for growing them successfully. Lieut.-Col. Sir George Holford, at Westonbirt, is without a rival in this respect, and is the possessor of a strain of exceptionally brilliant colour. To him Mr. Chamberlain appealed, and Sir George arrived one morning at Kew unexpectedly in a hansom cab laden with a noble burden of bulbs from his own collection. This gave Kew a start, and with some difficulty a house was adapted to grow them. Mr. Chamberlain had himself purchased from Messrs. Veitch at the price of £25 a single bulb of "*Grand Monarch*," a cross of exceptional merit: he allowed Kew to breed from it, and the result was "*Sir William*" and its progeny, a race with large flowers of splendid colour.

Kew possesses a collection of orchids which from a scientific point of view has no rival. It has been built up by the energy and cultural skill of the present Curator. Mr. Chamberlain thought that more concession should be made to popular taste in growing showy kinds of no more than horticultural attraction. Kew cannot afford to give a thousand guineas for an *Odontoglossum*; nor can it be expected to reflect every whim of passing fashion. Mr. Chamberlain contributed *Dendrobium* hybrids, the result of crosses made with his own hand. It must have been a gratification to him when in 1913 the munificence of Sir George Holford again realised his larger aim, and the Kew orchids can now appeal equally to the eye and to the intellect. It must not be supposed that in such matters his own taste was otherwise than refined and catholic. He had a wide knowledge of cultivated species. His "button-hole" was no affectation, but a note of affection for the plants from which official life kept him aloof. One night in the House of Commons the late Lord Avebury, then Sir John Lubbock, also appeared with an orchid in his button-hole. Mr. Chamberlain at once pounced upon it as something unknown to him. It was our native Butterfly orchid which Sir John had gathered that morning in his woods at High Elms. It is not trivial to touch on these matters. In drawing a portrait the small touches are at least as significant as the large outlines. Mr. Chamberlain's aim was throughout consistent; he desired that the splendour of a garden should not be the privilege only of the rich.

But he rendered an even greater service to Kew. The Great Temperate House was projected in 1855 by Sir William Hooker. It was designed as it now stands by Decimus Burton. In 1862 the

central portion and the octagons were finished. These were erected on a raised terrace on which space had been provided for the two wings. Their erection was, however, indefinitely postponed in 1863, although the foundations had been partially laid; part of the ironwork lay in the contractor's yard for many years, and was eventually broken up. The derelict condition of the terrace attracted Mr. Chamberlain's attention, and he asked for an explanation. He urged that the completion of the original design should be proceeded with. The First Commissioner of works (now Lord Gladstone) assented, and an estimate was prepared. When presented to the Chancellor of the Exchequer he at once put his pen through it with the remark, "a nation that requires a fleet, must do without a greenhouse." Sir William Harcourt, however, yielded in 1894 to a personal appeal from Mr. Chamberlain. Himself no mean gardener, the concession was perhaps not extorted very reluctantly. But it is at least certain that no one else could have obtained it, and Mr. Chamberlain was unaffectedly pleased at succeeding. In 1899 the work was completed; thirty-nine years had elapsed since its commencement. The new wings gave Kew what it had long wanted; a house for Himalayan plants and one for those of warm temperate countries.

In 1895 Mr. Chamberlain, with a change of ministry, became, perhaps somewhat to his surprise, Secretary of State for the Colonies. This is not the place for political history. But he brought to the vast field of Imperial affairs the same spirit which had animated him in a more limited. No detail was too insignificant for his attention. It is common knowledge that he raised the work of the Colonial Office to a position of distinction and efficiency which it had reached under no previous minister. He had the gift of carrying with him the enthusiasm of all who worked under him. His personal relations with the cultural work of Kew became less intimate for, as he said, "When a man is a Cabinet Minister, he can see little of his friends." But he made ample use officially of another aspect of its work as the adviser of the Government in all that concerns botanical enterprise in the Colonies.

One of the earliest questions to engage Mr. Chamberlain's attention was the depressed conditions of the West Indies. Their staple industry, the production of cane-sugar, had become unprofitable owing to the competition of beet-sugar supported by the bounty-system. The labourers on the estates thrown out of employment were starving, and revenues were dwindling. A Royal Commission of Enquiry, of which Sir Edward Grey and Sir David Barbour, K.C.S.I., were members, was appointed in 1897, and Dr. Morris (now Sir Daniel), the Assistant Director of Kew, was borrowed as expert adviser. As the result of its report a new Agricultural Department was created in 1898, and Dr. Morris left Kew to take up the post of Commissioner of Agriculture. The problem to be faced was not easy. Unemployed labour had to be absorbed; this could only be done by converting it into a peasant-proprietary. New staples were introduced, notably cotton, suited to such a system. But the peasants had to be instructed in their cultivation, and Kew was largely drawn

upon to supply Instructors. Sugar, however, was not neglected; every effort was made in Barbados to raise seedlings which would repay the cultivator by a more productive yield. The result has more than answered expectations; prosperity has been re-established with an increased revenue and an ampler trade.

In West Africa Mr. Chamberlain had to deal with a similar problem, though from different causes. The enforcement of peace and order necessitated an internal revenue, and this could only be produced by inducing the natives to engage in agriculture. Again the resources of Kew had to be drawn upon. The volume of its official work constantly increased, and in order to facilitate it the Director in 1902 was given an official status at the Colonial Office as Botanical Adviser to the Secretary of State for the Colonies.

These things, and they are enough to recall, are overshadowed by greater in the public eye. But Kew may say:—

Forsan et haec olim meminisse juvabit.

It was its privilege to see the human side of a great statesman. What love he could spare from the interests of his country he gave to plants. During his visit to South Africa the Barberton Daisy won his heart, and he brought it back as a personal trophy, hoping to do great things with it at Highbury.

Let this be for "Rosemary, that's for remembrance."

W. T. T. D.

XLIV.—NEW EUPHORBIACEAE FROM INDIA AND MALAYA.

A. T. GAGE.

Euphorbia (**Anisophyllum**) **katrajensis,** *Gage; E. erythrocladae,* Boiss., affinis, sed foliis majoribus linearibus vel sublinearibus et seminibus pustulatis differt.

Herba erecta, involucris exceptis omnino glabra, ad 40 cm. alta; caulis teres vel subteres, leve brunneus vel viridis, 2–4 mm. crassus, dichotome ramosus sed saepe sympodialis, internodiis 1–5·5 cm. longis; rami cauli similes sed minores. *Folia* opposita, brevissime petiolata, stipulata; lamina oblongo-elongata, vel late linearis, membranacea, 2·5–6·5 cm. longa, 3–8 mm. lata, apice rotundata vel subacuta vel apiculata, margine arcte serrulata, basi inaequilateraliter semicordata vel semiauriculata; pagina superior levi-viridis, sub lente minute punctata; pagina inferior glauca vel subglauca; costa media utrinque prominens; nervi utrinque obscuri; nervi basilares in costae mediae parte non auriculata 3–4, in parte auriculata 4–7, nervo in utraque parte summo validissimo excurvato; nervi laterales in costae mediae utraque parte 7–15 excurvati, inter se et inter nervos summos basilares anastomosantes; reticulatio ultima nonnihil crassa, polygonalis; petiolus vix 2 mm. longus, supra canaliculatus; stipulae interpetiolares, minutae, triangulares, fimbriatae. *Involucra* in caulis et ramorum axillis solitaria, pedicellata (pedicellis 1–8 mm. longis) turbi-

nata, circa 2·5 mm. longa; lobi 5, glandulas fere aequantes, oblongo-quadrati, fimbriati, intus parce villosi; glandulae 4, appendiculatae, sessiles, obconico-ellipticae, intus villosae, extra glabrae, apice transverse elliptico levi leviter concavo; glandularum appendiculae subaequales, suboblique late obcuneatae, circa 1 mm. longae, marginibus lateralibus integris, margine apicali crenulato. *Flores* ♂ pauci, cum bracteolis paucis plumosis. *Capsula* matura subpyramidaliter trilobata, sulcata, circa 3 mm. diametro; cocci rotundati, subcarinati; styli liberi, vix 0·5 mm. longi, bifidi; stigmata ovoidea, levissime incrassata. *Semina* late ovoideo-tetragona, circa 2 mm. longa, rubro-brunnea, pustulate leprosa, basi truncata peltate insculpta, apice subacuto e ventre oblique truncato; caruncula obsoleta.

India. Bombay Presidency: Katraj Hills, *Kanetkar*, *Shevade* (Herb. Poona).

Euphorbia (**Anisophyllum**) **minbuensis,** *Gage; E. granulatae,* Forsk., affinis, foliis in ramulis quam in ramis multo minoribus imbricatis, glandularum limbis crenulatis vel lobulatis diversa.

Herba parva, prostrata vel decumbens, ramosissima, ad 40 cm. diffusa, puberula. *Radix* teres, 1·5–3 mm. crassa. *Caules* vel rami primarii inferne teretes, superne leviter angulati, breviter puberuli, 1–2 mm. crassi, ad apices involucriferi; ramuli alterni, involucriferi, 1–4 cm. longi; internodia in ramis primariis 0·6–1 cm. longa. *Folia* disticha, stipulata, brevissime petiolata, in ramulis subimbricata; lamina coriacea, utrinque levi-viridis et sub lente minute punctata, obliquissime ovata, in caulibus et ramis primariis 0·5–1·2 cm. longa, 3–7 mm. lata, pagina superiore glabra vel parce puberula, pagina inferiore breviter puberula, apice rotundata vel leviter retusa vel mucronulata, basi valde inaequilateraliter rotundata, semiauriculata vel semicordata margine integro vel distanter serrulato; in ramulis lamina 2–5 mm. longa et plerumque utrinque valde puberula; costa media in pagina inferiore leviter prominens; nervi basilares in costae mediae parte auriculata 3–4, in parte altera 2–3, excurvati; nervi laterales costae mediae utraque parte 4–6; nervi omnes arborescenter anastomosantes, nervulis ultimis caecis; petiolus brevissimus, subteres, supra canaliculatus, puberulus; stipulae interpetiolares, lanceolatae vel anguste triangulares, puberulae, ciliolatae. *Involucra* solitaria, alternatim in axillis caulis et ramorum superioribus et in axillis ramulorum disposita, breviter valde pedicellata, circa 3 mm. longa (pedicello 1·5 mm. longo incluso), turbinata, extra puberula, intus parce subsetulose puberula glandulas adversus; lobi 5, glandulas fere aequantes, minuti, triangulari-lanceolati, ciliati; glandulae 4, appendiculatae, breviter late stipitatae, obconico-ellipticae, apice leviter concavo leve glabro, circa 0·5 mm. in diametro; limbi subintegri vel crenulati vel lobulati, glandularum latitudinem fere aequantes. *Flores* ♂ numerosi, pedicellis villosis. *Capsula* matura subglobosa, trilobata, sulcata, dense villosa, circa 2 mm. diametro; cocci subcarinati; styli brevissimi, puberuli, fere ad basem liberi, bifidi; stigmata ovoidea, incrassata. *Semina* ovoideo-tetragona, circa 1·5 mm. longa, rubro-brunnea, subtiliter granulata, obscure

transverse plurisulcata, apice subacuto e ventre oblique truncato ecaruncula to, basi subtruncata, peltate insculpta.

Burma. Minbu district: Sidoktaya, *Shaik Mokim* 370, 415; Legain, *Shaik Mokim* 716; Minbu Town, *Shaik Mokim* 992.

Euphorbia (Tithymalus) perbracteata, *Gage; E. dracunculoidi*, Lamk., affinis, sed bracteis connatis et seminibus levibus differt.

Herba erecta, ad 40 cm. alta, involucris exceptis omnino glabra. *Radix* teres, plus minusve tortuosa, lignosa, circa 3 mm. crassa. *Caulis* teres, stramineus vel fuscus, circa 3 mm. crassus, irregulariter foliatus, internodiis 0·4–3 cm. longis; rami cauli similes sed minus validi, simplices vel ad apices in umbellas divisi. *Folia* alterna, sessilia, exstipulata, linearia, membranacea, 1·5–6 cm. longa, 2–5 mm. lata, viridia, concoloria, apice breviter acuta, basi leviter inaequilateraliter obtusa, margine integro; costa utrinque prominens; nervi obscuri. *Inflorescentia* umbelliformis, in caule et ramis primariis terminalis, nonnunquam cum pedunculis solitariis e caulis axillis superioribus. *Umbellae* 2–4-radiatae, quot radii tot bracteis basilaribus foliaceis cinctae et involucrum floriferum solitarium ebracteatum breviter pedunculatum in centro gerentes; radii primarii validi, teretes, 2·5–5 cm. longi, ad apices in radios 2 secundarios divisi, cum involucro solitario in bifurcatione posito et infra bifurcationem bracteis 2 ovatis plus minusve connatis; radii secundarii in radios 2 tertiarios et nonnunquam radii tertiarii in radios 2 quarternarios divisi, omnes cum bracteis connatis et involucris centralibus solitariis ut supra descriptis instructi; caulis inflorescentia tota 4–20 cm. longa, 5–20 cm. lata; ramorum inflorescentiae minores; pedunculi ex axillis superioribus solitarii, umbellae radiis similes; umbellarum primariarum bracteae basilares liberae, foliis similes sed nonnihil latiores; bifurcationum bracteae foliaceae, late ovatae, semiamplexicaules vel frequentissime plus minusve connatae, 0·6–2·3 cm. longae et latae. *Involucrorum* pedunculi 1–7 mm. longi, teretes; involucra campanuliformia, circa 3 mm. longa, hyalina, extra glabra, intus glandulas adversus parcissime hirsuta; lobi 5, oblongi vel subtriangulariter elongati, sublacerati, circa 1 mm. longi, parce ciliolati; glandulae 4, late tenuiter stipitatae, extra glabrae, intus parcissime hirsutae, apice transverse elliptico circa 1 mm. in diametro transverso bicornuto leve leviter concavo, cornubus latitudinem apicalem aequantibus retusis vel bifidis, glandulae margine inter cornua subintegro vel plus minusve lobulato. *Flores* ♂ numerosi, pedicillis tenuibus elongatis parce et breviter ciliolatis cum bracteolis paucis elongatis mixtis. *Capsula* subpyramidaliter trilobata, sulcata, glabra, circa 4 mm. longa et 5 mm. lata; cocci ecarinati, rotundati; styli circa 1 mm. longi, fere ad basem liberi, breviter bifidi; stigmata transverse ovoidea, incrassata. *Semina* subgloboso-ovoidea, circa 3 mm. longa et 2 mm. lata, levia, gilvo-brunnea, versicoloria, basi truncata, peltate insculpta, apice subacuta, e ventre oblique truncata; caruncula subhyalina, irregulariter cuculliformis.

India. Gangetic Plain: United Provinces; Banda, *Mrs. Bell* 154.

Deccan: Central Provinces; Khandwa District, Baghwanpur, *Duthie* 8413; Nagpur District, Khat, *Duthie* 10,555, Tulara Hill, *Kalka Pershad* 31,611; Sururpur, *Haines* 3681.

This species has been confounded with *E. dracunculoides*, Lamk., and with *E. Rothiana*, Spreng.

Euphorbia (?**Sectio nova**) **clavidigitata,** *Gage;* a speciebus aliis indicis involucrorum segmentis glanduliferis digitatis omnino distincta.

Herba tenuis, vagans, ad 60 cm. diffusa. *Radix* tenuis, filiformis, circa 1 mm. diametro, frequenter ramosa. *Caules* pauci, filiformes, parce et dichotome ramosi, teretes, glabri, leves, circa 1–2 mm. diametro, internodiis 4–6 cm. longis, nodis leviter prominentibus, ramis paucis tenuissimis. *Folia* opposita, subsessilia, stipulata, coriacea, lineari-lanceolata, 1·5–4·5 cm. longa, 2–5 mm. lata, utrinque viridia et sub lente minute punctata, supra glabra, infra minute et parce setulose puberula, apice acuta, mucronulata, margine revoluta, scabridulose serrulata, basi inaequilateraliter subsemiauriculata; costa media in pagina superiore impressa, in pagina inferiore prominens; nervi basilares obscuri; nervi laterales in costae mediae utraque parte circa 20, brevissimi, ad marginem leviter excurvati, arborescenter ramosi et regulariter anastomosantes; nervuli ultimi caeci; stipulae interpetiolares, minutae, aculeatae. *Involucra* in cymis vel racemulis terminalibus vel axillaribus brevibus congestis parvis subcapituliformibus bracteatis disposita; cymae 0·5–1·5 cm. longae, 0·6–1·2 cm. latae; bracteae foliaceae, 1·5–5 mm. longae. *Involucra* in quaque cyma 3–8, pedicellata, turbinata; pedicelli 1 mm. longi, teretes, breviter puberuli; involucrum circa 2 mm. longum et vix 2 mm. latum, extra et intus prope fauces breviter puberulum; lobi 5, quam glandulae breviores vel glandulas aequantes, late ovati, vix 1 mm. lati, extra breviter puberuli, intus minute et parce setulosi, ciliolati, apice fimbriato-dentati; segmenta glandulifera 4, subaequalia, sepaloidea, membranacea, breviter oblonga vel oblongo-cuneata, circa 1 mm. longa, extra glabra, intus parce puberula, plus minusve in lobulos 5–7 digitiformes subaequales fissa, lobulo quocunque glandula minuta peltata coronato. *Flores* ♂ circa 20, pedicellis tenuibus teretibus glabris cum bracteolis elongatis plus minusve laceratis mixtis. *Capsula* matura pyramidaliter trigona, puberula, circa 2·5 mm. diametro; cocci subcarinati; styli tenues, fere ad basem liberi, circa 1·5 mm. longi, breviter bifidi; stigmata leviter incrassata. *Semina* subtrigono-ovoidea, vix 2 mm. longa, ecaruneulata, rubro-brunnea, in ventre subexcavata, basi obtusa, apice subacuta.

Burma. Pegu Yomah, in "Eng" Forest, *Kurz* 1579; Hanthawaddy district, Lahamange, *Lace* 2900.

Cleistanthus hirsutopetalus, *Gage;* a speciebus aliis malayanis petalis extra longe hirsutis distincta.

Arbor circa 10 m. alta. *Ramuli* tenues, teretes, glabri, lenticellati, fusco-brunnei, 2–3 mm. crassi. *Foliorum* lamina anguste ovato-elliptica vel lanceolata, coriacea, 7–18 cm. longa. 3–5·5 cm. lata, apice subcaudate acuminata, margine integro, basi rotundata vel subcuneata et in costae mediae utraque parte minute

pulvinata; pagina superior sicco levi-olivacea vel brunneo-olivacea, glabra, nitida, costa media costis lateralibus et reticulatione obscuris; pagina inferior dilute olivacea; nervi laterales quam in pagina superiore minus obscuri, in costae mediae utraque parte 6–8, tenues, excurvati, intra marginem anastomosantes; petiolus subteres, glaber, transverse corrugatulus, 3–7 mm. longus; stipulae caducae, lanceolatae, circa 3 mm. longae, glabrae vel parcissime puberulae. *Glomeruli* floriferi axillares, solum flores ♂ vel flores ♀ gerentes; bracteolae ovatae vel lanceolatae extra plus minusve rufo-pubescentes et subcarinatae, intus glabrae. *Flores* ♂ non visi. *Flores* ♀ ovoidei, sessiles, 6 mm. longi; calyx extra adpresse hirsutus, intus glaber, in sepala 5 deltoidea vel lanceolata dimidiater fissus; petala 5, obovata, integra, extra longe adpresse hirsuta, intus glabra, circa 1·5 mm. longa; discus calycis partem inferiorem vestiens et annulo subconico dentato ovarii partem inferiorem cingente instructus; staminodia 5, minuta, squamiformia; ovarium subgloboso-ovoideum, hirsutum. *Capsula* pedicello valido 3 mm. longo obconice terete parce adpresse hirsuto instructa, glabra vel prope basem parce hirsuta, levis, fere nitida, levi-brunnea, 1 cm. in diametro verticale; cocci rotundati. *Semina* suborbiculari-ovoidea, 8 mm. longa, 7 mm. lata, 5 mm. crassa.

Malay Peninsula. Penang: Penara Bukit, *Curtis* 3049; Bukit Tumiary (collector unknown) 1420 (1655).

Cleistanthus praetermissus, *Gage; C. nitido*, Hook. f., affinis sed floribus glabris distinctus.

Ramuli levi-straminei, glabri, pustulati, 2–4 mm. crassi. *Lamina* elliptico-lanceolata, membranacea, 8–13 cm. longa, 3–5 cm. lata, apice longe acuminata, margine integro, basi acuta vel cuneata; pagina superior sicco fusco-olivacea, glabra, subnitida, obscure reticulata, costa et nervis lateralibus leviter impressis; pagina inferior brunnea, plus minusve glauca, in costa et nervis lateralibus plus minusve hirsuta; nervi laterales in costae utraque parte 6–8, excurvati et intra marginem anastomosantes; nervuli transversi paulum distantes et irregulares; reticulatio ultima—luce transmissa modo visa—densa, subquadrate polygonalis; petiolus tenuis, subteres, glaber, in sicco niger, dense et irregulariter corrugatulus, 5–6 mm. longus; stipulae caducae. *Glomeruli* parvi, pauci-floriferi et flores ♂ vel flores ♀ tantum gerentes, axillares vel in ramulis brevibus lateralibus spiciformibus dispositi; bracteolae minutae, ovatae, acutae vel acuminatae, extra plus minusve adpresse hirsutae et carinatae, intus glabrae. *Flores* ♂ non visi. *Flores* ♀ sessiles, ovoidei; calyx omnino glaber, in sepala 5 deltoidea vel lanceolata ad medium fissus: petala breviter unguiculata, subspatulato-obovata, subcrenulata, circa 1·5 mm. longa, glabra; dicus glaber, calycis partem inferiorem vestiens et annulo membranaceo subconico irregulariter dentato ovarii partem inferiorem cingente instructus; staminodia 5, minuta, squamiformia; ovarium subgloboso-ovoideum, hirsutum; styli basi connati, breves, subteretes, glabri, brevissime bifidi; stigmata subspatulata. *Capsula* sessilis, 8 mm. alta, 11 mm. lata, prope apicem et basem et in sulcis parce hirsuta, aliter glabra,

sicco nigra, nitida, obscure reticulata; cocci rotundati, ecarinati. *Semina*—non omnino matura—fusco- et gilvo-variegata, levia, 6 mm. longa, 5 mm. lata, 4 mm. crassa, apice subacuta, basi obtusa, excavata.

Malay Peninsula. Dinding: Gunong Tungul, *Ridley* 9440.

Phyllanthus (Reidia) filicifolius, *Gage; P. pulchro*, Wall., distanter accedit, sed habitu et sepalis dentatis haud profunde laceratis omnino distinctus.

Frutex parvus, omnino glaber. *Caulis* in specimine viso simplex, erectus, brunneus, infra teres, supra subcompressus, 1–4 mm. crassus, foliis multo reductis squamiformibus, internodiis circa 5 mm. longis. *Ramuli* solitarii vel 2–3 ex axillis, ad 4 cm. longi, circa 0·2 mm. crassi, subcompressi, brunnei, internodiis 1–3 mm. longis. *Squamae* foliaceae et stipulae in caule minutae, triangulares, scariosae; folia in ramulis bifaria, breviter petiolata; lamina inaequilateralis, oblique obovata, membranacea, 0·4–1 cm. longa, 3–6 mm. lata, apice subacuta vel breviter acuta, margine integro, basi latere altero rotundata, altero subcuneata; pagina superior sicco fusco-olivacea, obscura, sub lente leviter granulata, costa tenuissima et obscura; pagina inferior subvelutina, glauca; nervi laterales—luce transmissa tantum visi—in costae utraque parte 4–5, excurvati et intra marginem anastomosantes; reticulatio nonnihil crassa, irregulariter polygonalis; petiolus subteres, circa 0·3 mm. longus; stipulae minutae, late triangulares, acutae, membranaceae vel subscariosae, circa 0·3 mm. longae. *Flores* in ramulis axillares, pedicellati; flores ♂ in axillis inferioribus, flores ♀ in superioribus. *Flores* ♂ solitarii vel subsolitarii, e nodulis bracteolatis axillaribus orti; bracteolae minutae, sublanceolatae; pedicelli filiformes, ad 1 cm. longi; calyx in alabastro subglobosus et circa 1 mm. diametro, in flore aperto cruciformis, circa 2·5 mm. in diametro transverso, in sepala 4 subaequalia biserialia profunde fissus; sepala late obovata, membranacea, circa 1 mm. longa, leviter pulverulenta, margine apicali irregulariter et breviter dentato; sepala exteriora apiculata; glandulae 4, cum sepalis alternantes, subcarnosae, subreniformes, peltatae, circa 0·5 mm. in diametro transverso; androecii columna brevissima, antheras 2 minutas gerens; loculi antherarum subhorizontaliter divergentes. *Flores* ♀ solitarii; pedicelli quam ii floris masculi minus filiformes, rigidi, teretes, recti vel curvati, infra calycis basem leviter infundibuliformes; calyx in flore aperto circa 3·5 mm. in diametro transverso, in sepala 5–7 subinaequalia obovata membranacea subintegra plus minusve pulverulenta profunde fissus; discus breviter calyculiformis, ovarii inferiorem partem cingens, margine leviter et irregulariter incrassato; ovarium subglobose et sulcate trilobatum, circa 1 mm. in diametro transverso; styli 3, brevissimi, basi connati, profunde bifidi; stigmata erecta, divergentia, subulata. *Capsula* levi-brunnea, circa 2 mm. diametro, stylis persistentibus coronata; cocci rotundati, ecarinati. *Semina* triquetra, circa 1·6 mm. longa, rubro-brunnea, leviter granulata, dorso convexa, ecarinata, lateribus planis, apice acuto compresso, basi rotundata.

Malay Peninsula. Kedah: Langkawi, Coah, *Curtis* 2548.

XLV.—ECONOMIC NOTES—SWANSEA AND DISTRICT.

J. H. HOLLAND.

In the course of a visit to Swansea during the Museums Conference, July 6–11, 1914, the opportunity was taken to visit the Swansea Docks and also those at Bristol, Avonmouth and Cardiff. At Bristol the Museums and Art Gallery well repaid a visit; the Botany collection in the Dame Emily Smyth Room being of especial interest. Margam Park was also visited with the members of the conference on the invitation of Miss Talbot (see *K. B.* 1907, pp. 390-392). A visit was paid to several of the parks in Swansea, the principal of which are the Victoria, Cwm Donkin and Morriston.

The following plants and produce were noted in the short time at my disposal:—

"New Zealand Flax or Hemp" (*Phormium tenax*).—Two fine specimen plants in the Bamboo Garden at Margam Park. The fibre, in bales 4 feet by 3 feet 6 inches by 2 feet 6 inches, each weighing about 489 lbs., sewn loosely in "Gunny" cloth, was being landed at the Avonmouth Dock from the SS. "Buteshire" from New Zealand.

Peas (*Pisum arvense*) from New Zealand were being landed from the same ship; they are used in this country for feeding pheasants.

Bananas (*Musa sapientum*), from the West Indies. The SS. "Patia" was at the moment unloading a cargo of 65,000 bunches for Messrs. Elders and Fyffes. Each bunch was stood on the cut-end of the stalk and placed side by side in the hold consisting of three decks. They were being raised by means of elevators fore and aft, each elevator carrying about six bunches singly in cradles at a time. As each bunch reached the top it was thrown by two men, one on either side, on to a bed of straw covered with mat and immediately picked up by another man, who handed it over the side of the ship to a carrier on the wharf, who in turn handed it in to a ventilated railway van, where each bunch was arranged in the same manner as in the hold of the vessel. Tally was being taken at the entrance to each van.

Unloading was also going on through two large outlets from the hold, one fore, one aft, on to the wharf, single bunches being passed out at a time. All the bunches were quite green. Some 700 men were hard at work, and certainly this number conveyed a true impression of the "driver ant" like crowd, who from their appearance made one appreciate fully the provision that nature has provided the banana with a detachable skin.

Canadian Birch (*Betula papyrifera*).—Boards 1 inch to 4 inches; logs squared, of varying dimensions, one $18\frac{1}{2}$ feet by $16\frac{1}{2}$ inches square, and logs in the round up to 2 feet 6 inches in diameter had been recently discharged at King Edward Dock from ss. "Englishman" from Montreal. Birch wood is used largely in making boxes to contain tin plates, the export of which is one of the staple industries of Swansea and district. Some boxes lying in Messrs. Power, Bacon and Hough's Warehouse, South Dock, Swansea, ready for despatch to Rangoon and Calcutta were

20 inches by 14 inches and 28 inches by 20 inches, each containing 112 thin sheets of tin, and boxes 20 inches by 10 inches, somewhat deeper, contained 225 sheets of tin. At a large works at South Dock, Swansea, where these boxes are made, the size being made was 36 inches by 11 inches by $1\frac{3}{4}$ inches. The side pieces and ends from a piece examined since at Kew are of this Birch, but a piece of the wood used to form the bottom and top since examined appears to be American Sugar Maple (*Acer saccharinum*), the same wood is largely used for floor blocks. In appearance, physical characters and uses, these woods are very similar and might in the trade sometimes pass for the same. Some particulars of the Sugar Maple (*Acer saccharinum*) are given in *K. B.* 1911, pp. 303-304.

"Spruce Boards" (*Picea excelsa*), from Norway; white prepared boards from Norway; "Yellow or Pine Deal" (*Pinus* spp.) from America; "Red Pine" (*Pinus sylvestris*) from Archangel and "Oregon Pine" (*Pseudotsuga Douglasii*) from British Columbia were timbers imported to the Prince of Wales Dock, Swansea, for use by Messrs. John Lewis & Sons, timber merchants.

"Pit Props" or "Pit Wood" (*Pinus Pinaster*; *Picea excelsa*). —During the summer months immense stacks of these props may be seen in the docks near the mining centres, Swansea, Cardiff, Hull, etc. In the King's Dock, Swansea, the SS. "Torvore" was discharging 1700 tons from Bordeaux, Lisbon and Oporto. A piece out of this shipment proves it to be *Pinus Pinaster*, Soland., the largely cultivated "Cluster Pine" of the Mediterranean region. This is the Pine tree tapped for resin in the forests near Bordeaux and yields the "Bordeaux Turpentine" of commerce; many of the pieces in the consignment mentioned bore evidence of the tapping. They averaged 9 to 13 feet in length and 3 inches to 8 inches in diameter at the top and were covered with bark. Shipments of props from Bordeaux to the United Kingdom are made regularly throughout the year (Cons. Rep. Ann. No. 5319, 1914, p. 24).

In the Roath Dock, Cardiff, the SS. "Villa Garcia" had apparently just come in fully laden with the same bark-covered props, though these were said to be Spanish.

The Common Spruce (*Picea excelsa*, Link.) is also largely used for pit props, and stacks of it were seen in the King's Dock, Swansea, and in the Queen Alexandra and Roath Docks, Cardiff, where they covered many acres. The following sizes were noticed: 4 feet 6 inches, with a diameter of $3\frac{1}{2}$ inches; 5 feet, with a diameter of 6 inches, and 9 feet with a diameter of 7 inches. These props are cut into shorter lengths according to the demand from the pits. One large stack in the Roath Dock, Cardiff, containing 3305 props, was built up of eight smaller stacks, each marked on one prop with the dimensions and number of pieces in the stack as B $4\frac{1}{2}$ by $3\frac{1}{2}$—312; B $4\frac{1}{2}$ by $2\frac{1}{2}$—506, etc. Other stacks were built up in the same way of props of different dimensions and marked with another letter.

The Common Spruce is a native of the mountains of Northern and Central Europe, and the Baltic is the principal outlet for the wood. The Baltic props are distinguished from the French at the time of arrival by being clean barked. The trees are cut during the winter and the prepared wood shipped in the summer.

The large and continuous trade in this class of wood is indicated in the returns given by the Customs in "Trade of the United Kingdom" (vol. i. 1913, p. 201), the imports for 1912 being, from Russia 1,276,523 loads, value £1,920,653; Sweden, 322,344 loads, value £479,266; Norway, 111,349 loads, value £179,511; Germany, 18,554 loads, value £30,419; France, 838,450 loads, value £719,970; Portugal, 271,190 loads, value £245,384; and Spain, 80,357 loads, value £74,206. The price per English ton, f.o.b. Bordeaux, may vary from 14s. 9d. to 18s., and the freight from 4s. 6d. to 8s. per ton—4s. 6d. to 4s. 9d. per ton in 1914 are, it is reported, the lowest rates ever quoted—(Cons. Rep. l.c.). Those from the northern countries would probably be *Picea excelsa*, and from the southern *Pinus Pinaster*, although it ought to be mentioned that the "Stone" or "Umbrella" Pine (*Pinus Pinea*), of the Mediterranean region—a very similar wood to that of the last mentioned—and the Silver Fir (*Abies pectinata*) from the mountains of Central and S. Europe, are used for a similar purpose in mines.

Incidental to this subject two interesting specimens were observed, one a lichen (*Parmelia caperata*, Ach)—the "wrinkled sulphur Parmelia," frequent, especially in mountainous districts of Europe, occurring on the Himalayas, in New Zealand, and other parts of the world—on a piece of bark of a French Pit Prop (*Pinus Pinaster*), picked up from a heap lying on the deck of the SS. "Torvore," and the other, a petrified pit prop at the Royal Institution of South Wales—one of the exhibits at the reception given to the members of the Conference by the ex-President of the Institute.

Cotton seed (*Gossypium* spp.).—Many tons in bags of Uganda seed, shipped from Mombasa, May 1913, were stored, belonging to Messrs. John Robinson and Company, Limited, and the "Clan Chattan" from Calcutta had just arrived with 3000 tons of cotton seed for the same firm. By a special favour the writer was shown over their mills, and the various stages through which the cotton seed passes from the removal of the "lint" and "fuzz" to the pressing out of the oil and drying of the cake for feeding purposes were of exceptional interest. Egyptian seed is also crushed largely there.

"Cottolene," a lard-like substance, composed of cotton seed oil and Oleo-stearine from New Orleans, and Cotton Cake, Silcocks' "Lucky Star" and meal from Liverpool were stored in Messrs. Power, Bacon and Hough's Warehouse, South Dock, Swansea.

Soy Bean (*Glycine Soja*), crushed at the above mills, though nothing at the moment was being done with it. A store of cake was seen.

This bean came into prominence a few years ago, and full particulars of it are given in *K. B.*, Additional series, ix., part 2, pp. 211–214.

Manila Hemp (*Musa textilis*); bundles of "binder" twine made of this fibre stood in a warehouse, King Edward Dock, Avonmouth, recently landed from the SS. "Englishman," from Montreal; each bundle contained 10 balls, total weight about 56 lbs.

Horse Beans (*Vicia Faba*, var. *equina*); many tons in bags were

lying in an open shed on the wharf, King Edward Dock, Avonmouth. They had come, it was understood, many months before by the vessel "Yeddo," from Vladivostok.

Ground Nuts (*Arachis hypogaea*) in bags from Liverpool stored in Messrs. Power, Bacon and Hough's Warehouse at South Dock, Swansea (see *K. B.* 1901, pp. 175–200: Add. ser. ix. part 2, 1911, pp. 201–206).

Potatoes.—A small steamer, SS. "Ashton," in the West Dock, Cardiff, was at the time of passing unloading 280 tons from Pont L'Abbé, S.W. Brittany. They were loose in the hold, and were being filled into bags and baskets by men and women, weighed and loaded direct into wagons waiting near for immediate despatch to various parts of the town. These potatoes appeared to be between the quite new and the old, they could not have been handled in the same rough way, while the skins were very tender.

According to a recent Consular Report (No. 5279, 1914, p. 9) for the District of Brest, the amount of Potatoes exported from Pont l'Abbé and other Ports of Finistere—Concaneau, Loctudy, and Roscoff—to the United Kingdom in 1913, is given at 12,853 tons, value £47,218.

XLVI.—DIAGNOSES AFRICANAE: LX.

1511. **Leptoderris aurantiaca,** *Dunn* [Leguminosae-Dalbergieae]; *L. calvae*, Dunn, affinis, paniculae rhachi velutina, stipulisque infra insertionem productis distincta.

Frutex erectus vel scandens, praeter inflorescentiam glaber, cortice laevi striato. *Folia* 4-juga, 30–40 cm. longa, petiolo 5-plo longiora; stipulae lanceolatae, paullo supra basin affixae, 2 cm. longae; foliola superiora lateralia obovata, breviter acuminata, ad basin attenuata, obtusa, 9–11 cm. longa, chartacea; nervi marginem propinquantes 8–9-pares, infra prominentes, supra impressi; petioli 5 mm. longi; stipellae setaceae, 2 mm. longae. *Paniculae* axillares et terminales, 20–50 cm. longae, a basi ramosae, rhachi ramisque longis dense velutinis; nodi floriferi 1–2 mm. longi; rhaches ramorum bracteis magnis pubescentibus tarde deciduis suffultae. *Flores* conferti, 6–7 mm. longi; pedicelli 1 mm. longi. *Calyx* tubularis, 2·5 mm. longus, laxe sericeus. *Petala* glabra; vexilli lamina ovata, ad basin angustata; alae oblongae, basi hamatae; carinae petala ovata, apice acuta, basi truncata. *Stamina* praeter vexillare basi solutum connata. *Ovarium* medio biovulatum. *Legumen* oblongo-lineare, apice basique obtusum, 10–13 cm. longum, 3–4 cm. latum, glabrum, indehiscens, papyraceum, uno latere alatum, reticulatum. *Semina* 1–2, disciformia; cotyledones cordatae.

Tropical Africa. French Congo, *Klaine* 67, 655, 1172.

1512. **Leptoderris cyclocarpa,** *Dunn* [Leguminosae-Dalbergieae]; *L. aurantiacae*, Dunn, foliis affinis sed ab ea omnibusque speciebus hujus generis quarum fructus noti sunt leguminibus distincta.

Frutex scandens, praeter inflorescentiam glaber, ramulis rugosis griseis. *Folia* 2-juga, 20–30 cm. longa, petiolis 4-plo

longiora, stipulis deciduis; foliola superiora lateralia obovata, apice rotundata vel obtuse acuminata, apiculata, 8–12 cm. longa, chartacea, supra nitentia, subtus opaca, reticulata; nervi marginem propinquantes, 6–7-pares, infra prominentes; petioluli 3–4 mm. longi; stipellae setaceae, 3 mm. longae. *Paniculae* axillares, ad 12 cm. longae; rhachis breviter et tenuiter ferruginea; ramuli floriferi fere ad basin rhachis simplicis producti, 13 mm. longi, ferruginei. *Flores* dense conferti, 11 mm. longi; pedicelli 1 mm. longi. *Calyx* campanulatus, 4 mm. longus, dense sericeus, dentibus tubo 5-plo brevioribus, late triangularibus; bracteolae ovatae, calcyce bis breviores. *Petala* glabra, lutea; vexilli lamina oblongo-ovata, basi paullo plicata, rotundata; alae basi hamatae, lineari-oblongae; carinae petala similia. *Stamina* monadelpha. *Ovarium* medio biovulatum. *Legumen* disciforme, 3 cm. diametro, 5 mm. crassum, anguste alatum. *Semen* unicum, 2·5 cm. diametro; cotyledones cordatae.

Tropical Africa. French Guinea: Ditinn, *Chevalier* 13,578.

1513. **Leptoderris velutina,** *Dunn* [Leguminosae-Dalbergieae]; *L. reticulatae*, Dunn, affinis, paniculae ramis brevibus divaricatis et foliolis paniculisque saepe multo majoribus distincta.

Frutex scandens, ramulis dense velutinis. *Folia* 3-juga, 30–40 cm. longa, rhachi ut ramulis vestita; stipulae persistentes, 4 mm. longae, 5 mm. latae, velutinae; foliola superiora lateralia margine revoluta, oblongo-obovata, 10–13 cm. longa, 5 cm. lata, coriacea, supra glabra, nitentia, subtus dense breviter tomentosa; venae marginem proximantes, 6–pares, venulis subtus reticulatis; petioli 5 mm. longi; stipellae 3–4 mm. longae. *Paniculae* a medio ad apicem divaricate ramosae, terminales, 20–40 cm. longae; rhachis ut ramuli vestita; nodi floriferi 2–3 mm. longi. *Flores* conferti, 1·1 cm. longi; pedicelli 1–2 mm. longi. *Calyx* tubulosus, 4 mm. longus, velutinus. *Petala* glabra; vexilli lamina anguste oblonga, cordata, marginibus involutis; alae lineari-oblongae, basi hamatae; carinae petala oblonga. *Stamina* monadelpha, vexillari basi soluto. *Discus* glandulosus. *Ovarium* multiovulatum. *Legumen* papyraceum, oblongum, 9 cm. longum, 2·5 cm. latum, uno latere anguste alatum, reticulatum. *Semina* 1–2.

Tropical Africa. French Congo: Libreville, *Klaine* 71,636.

1514. **Crassula** (**Eucrassula**) **pectinata,** *Conrath* [Crassulaceae]; affinis *C. Turritae*, Thunb., a qua foliis radicalibus breviter ovatis obtusis, caulis indumento, petalis longiuscule cuspidatis differt.

Caulis rigide erectus, simplex, 2–4·5 dm. altus, pilis crassiusculis obtusis patentibus breviter dense pubescens. *Folia* radicalia conferto-rosulata, ovata vel orbiculari-ovata, obtusa vel rotundata, usque ad 4 cm. longa, 3 cm. lata, utrinque glabra, setulis crassiusculis acutis pellucidis pectinato-ciliata; folia caulina opposita, sessilia, libera, suberecta, ovata vel oblongo-ovata, obtusa, pectinato-ciliata, ceterum glabra, internodiis circiter 2·5 cm. longis paullo longiora vel breviora. *Inflorescentia* thyrsoidea, spiciformis, e verticillastris superpositis circiter 15 caulis versus apicem valde approximatis constans, paribus duobus inferioribus bractearum thyrsos circiter 3 cm. longos

suffulcientibus; bracteae foliis caulinis similes, sed magis triangulari-ovatae, multo minores, cymis breviores, acutiusculae, extra minute dense pubescentes, pectinato-ciliatae; verticillastri fasciculiformes, ut thyrsi breviter pedunculati, intermedii 1 cm. inter se distantes, circiter 1·5 cm. diametro; bracteolae triangulari-lanceolatae; pedicelli circiter 2·5 mm. longi, glabri. *Calycis* segmenta oblonga, acutiuscula, circiter 2·5 mm. longa, dorso marginibusque pilis brevibus sparse induta. *Petala* basi connata, oblongo-elliptica, 3 mm. longa, trinervia, cuspidata, cuspide subulato-conico aspero antherae subaequilongo. *Stamina* circiter 2·5 mm. longa; filamenta plana, late linearia, infra antheras abrupte contracta. *Folliculi* oblongi, parum obliqui, 1·5 mm. longi, stigmate brevi.

South Africa. Transvaal: Modderfontein, *Conrath* 287.

1515. **Kalanchoe Pearsonii,** *N. E. Brown* [Crassulaceae]; similis *K. multiflorae*, Schinz, sed bracteis et floribus majoribus, calyce tubo corollae aequilongo conspicue differt.

Herba succulenta, circa 60 cm. alta, omnino glabra. *Caulis* basi 8 mm. crassus, teres vel vix angulatus. *Folia* opposita, sessilia, inferiora 10–12·5 cm. longa, 1–2 cm. lata, superiora gradatim minora, anguste oblongo-linearia, obtusa vel subacuta, integra. *Cymae* corymbosae, compactae, ad 10 cm. latae, ramis suberectis. *Bracteae* 1–2·5 cm. longae, 1·5–3 mm. latae, lineares, acutae. *Pedicelli* 0·8–1·5 cm. longi. *Sepala* libera, 1–1·2 cm. longa, 2–3 mm. lata, linearia, acuta. *Corollae* tubus 0·9–1·1 cm. longus, suburceolatus, 4-angularis; lobi 6 mm longi, 2·5 mm. lati, acuti, lutei.

Tropical Africa. South Angola: fairly common on the Huilla Plateau, near Humpata, 2000 m., *Pearson* 2149.

1516. **Mussaenda odorata,** *Hutchinson* [Rubiaceae-Mussaendeae]; affinis *M. Holstii*, Wernham, sed foliorum nervis subtus subdense pubescentibus, corollae tubo latiore brevioreque lobis longe acuminatis differt.

Arbor riparia, parva, usque ad 6 m. alta; ramuli teretes, prominenter lenticellati, breviter adpresse pubescentes; internodii 1·5–4 cm. longi. *Folia* elliptica vel obovato-elliptica, acute acuminata, basi cuneata, 12–17 cm. longa, 6–10 cm. lata, membranacea vel subchartacea, supra parce setuloso-pubescentia, infra in nervis venisque dense patente pubescentia; nervi laterales utrinque 10–15, arcuati, inferne subopposite, venis laxis gracilibus; petioli 1·5–2 cm. longi, leviter compressi, rufo-puberuli; stipulae caducae, non visae. *Cymae* laxe ramosae, circiter 20 cm. diametro; bracteae lineari-lanceolatae, acutae, usque ad 1·3 cm. longae, extra adpresse pubescentes. *Receptaculum* campanulato-globosum, tomentosum. *Calycis* segmenta subulato-linearia, acutissima, 1 cm. longa, extra adpresse pubescentia, uno saepe in laminam petaliferam albam late ovatam obtuse acuminatam 8–9 cm. longam 5–7 cm. latam puberulam producto. *Corollae* tubus cylindricus, 2·5 cm. longus, 3 mm. diametro, infra superne dense flavo-villosus, extra adpresse tomentosus; lobi 5. ovati, longe caudato-acuminati, circiter 8 mm. longi, 4–5 mm. lati, puberuli. *Stamina* in corollae tubi medio

inserta; antherae 4 mm. longae. *Stylus* gracilis, 2 cm. longus, glaber, trilobatus, lobis lanceolatis obtusis 3–4 mm. longis. *Fructus* subglobosus, circiter 1 cm. diametro, puberulus.

Tropical Africa. British East Africa: streams of South-East Kenya, 1835–1990 m., *Battiscombe* 708.

Mr. Battiscombe states that the flower is sweet scented, and that the petaloid sepals give the tree the appearance of a white *Poinsettia*.

1517. **Landtia lobulata,** *Hutchinson* [Compositae-Arctotideae]; affinis *L. Ruppellii,* Benth., sed foliis basi lobulatis crassioribus bullatis differt.

Herba patula, parva, subaculis; rhizoma crassum, fibrosum, radicibus elongatis teretibus crassis. *Folia* radicalia, petiolata, basi pinnatim bilobulata, superne ovata, crasse sinuato-dentata, obtusa, 2–3·5 cm. longa, 2–2·5 cm. lata, rigide coriacea, bullata, supra viridia, glabra, infra cano-tomentosa, nervis lateralibus utrinque 4–5 infra prominulis; petioli usque ad 3 cm. longi, robusti, subglabri. *Capitula* pedunculata, circiter 2 cm. expansa; pedunculus crassus, 1–1·5 cm. longus, dense lanatus. *Involucri* bracteae 4–seriatae, exterioribus lanceolatis acute acuminatis extra pubescentibus, interioribus oblongis apice rotundatis membranaceis glabris. *Flores* radii 2 cm. longi; corolla glabra; tubus 3 mm. longus; ligula minute tridentata. *Flores* disci 0·8 cm. longi; corollae tubus glaber, inferne cylindricus, superne anguste campanulatus, lobis 5 lineari-lanceolatis apice cucullatis. *Achaenia* subcylindrica, 2 mm. longa, glabra. *Pappus* vix 1 mm. longus, argenteus.

Tropical Africa. British East Africa: upper slopes of Kinangop Mountains, 3000–4000 m., *Galpin* 7918.

1518. **Brachystelma linearifolium,** *Turrill* [Asclepiadaceae-Ceropegieae]; *B. longifolio,* N. E. Brown, affinis, sed floribus majoribus facile distinguendum.

Herba perennis; rhizoma tuberosum, 5 cm. diametro; caulis erectus, inferne ramosus, teres, 12 cm. altus, minute puberulus, purpureo-viridis. *Folia* numerosa, linearia, acuta, basi leviter angustata, usque ad 8 cm. longa et 5 mm. lata, costa pagina inferiore prominente, superiore canaliculata, nervis lateralibus pagina utraque obscuris, margine et costa subtus scabriusculis exceptis glabra. *Inflorescentia* uniflora, axillaris; pedicellus 1·5 cm. longus, minute puberulus, purpureo-viridis. *Calycis* lobi 5, lineari-lanceolati, acutissimi, 4 mm. longi, basi 1 mm. lati, extra leviter puberuli. *Corollae* purpureae tubus brevissimus; lobi patentes, liberi, lineari-oblongi, replicati, apice acuti, 2·1 cm. longi, 4 mm. lati, margine minute ciliati, intus purpurei, extra viridi-purpurei. *Corona* biseriata; exterior e lobis 5 alte bifidis 3 mm. longis patentibus inferne pilis albis reversis instructis purpureis constituta; interior e lobis conniventibus 1 mm. longis ventricosis obtusis purpureis constituta. *Staminum* columna circiter 1·5 mm. alta, flava. *Carpella* (stigmate excluso) 2 mm. alta, 0·75 mm. diametro, viridia, glabra.

Tropical Africa. Rhodesia, *Hislop.*

Described from a plant grown at Kew and flowering in July of the current year (1914).

1519. **Huernia transvaalensis,** *Stent* [Asclepiadaceae-Stapelieae]; affinis *H. guttatae*, R. Br., sed corollae tubo intus pilis purpureis ornato, lobis atropurpureis basi flavo-lineatis et coronae interioris lobis apice recurvis differt.

Herba succulenta, nana, aphylla. *Rami* 4–6 cm. longi, dentibus exclusis 1·5–1·8 cm. crassi, 4–5-angulati, glabri, angulis dentibus deltoideis acutis 4–7 mm. longis armatis. *Flores* 1–3, e basi caulium enati. *Pedicelli* 1·2–1·8 cm. longi, glabri. *Sepala* 1–1·4 cm. longa, subulato-attenuata, glabra. *Corolla* 4–5 cm. diametro, extra glabra, purpureo-tincta, ore tubi pilis longis purpureis papillis enatis intus ornato, cetera glabra; tubus 7–8 mm. longus ore 6–7 mm. diametro, campanulatus, pallidus; limbus e tubo horizontaliter patulus; discus in annulum pulviniformem elevatus, atropurpureus, nitidissimus; lobi subpatuli 1·5 cm. longi et lati, deltoidei, acuminati, rubro-purpurei, basi irregulariter pallide luteo-notati. *Coronae* exterioris lobi 2 mm. longi, 3 mm. lati, transversim rectanguli, breviter et obtuse bifidi, lutescentes, purpureo-marginati; interioris lobi 3 mm. longi, subulati, acuti, basi erecti, superne recurvi, purpurei.

South Africa. Transvaal: Crocodile Poort, in the Magaliesberg Range, *I. B. Pole Evans*, Aug. 24, 1913.

The photographs (plate facing p. 250), were taken by Mr. Pole Evans of the plant growing in the garden attached to the Laboratory of the Department of Agriculture at Pretoria, where it had been flowering profusely from December to April. It was found in sandy places among rocks on the Magaliesberg Range.

The light coloured ring on the disk of the corolla is not due to colouration but is caused by the reflection of light from the very shining blackish purple surface of that part.

1520. **Bridelia Schlechteri,** *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *B. tenuifoliae*, Muell. Arg., foliis angustioribus infra glaucis nervis lateralibus vix ramosis differt.

Rami graciles, lenticellis prominentibus instructi; ramuli juniores elongati, nodis leviter pubescentibus. *Folia* oblongo-oblanceolata, subacuta, basi leviter attenuata vel rotundata, 2·5–6 cm. longa, 1·3–3 cm. lata, chartacea, utrinque glabra, infra glauca; nervi laterales ad marginem elongati, arcuati, gracillimi, utrinque distincti; nervi tertiarii paralleli, graciles; petioli 2·5–3 cm. longi, nigri, verrucosi, paullo pubescentes; stipulae subcaducae, subulato-lanceolatae, acuminatae, 4 mm. longae, pubescentes. *Flores* ♂ breviter pedicellati. *Sepala* ovata, obtusa, circiter 2 mm. longa, 1 mm. lata, glabra. *Petala* suborbicularia, 1 mm. longa, carnosa, apice obscure denticulata. *Discus* orbicularis, planus, carnosus. *Columna* staminalis gracilis, 1·5 mm. longa; antherae parvae. *Ovarii* rudimentum plus minusve subulatum. *Flores* ♀ subsessiles, basi pubescentes: *Sepala* et petala ut in floribus ♂. *Discus* glaber. *Ovarium* ellipsoideum, laeve; styli 2, ad basin liberi, profunde bilobi. *Fructus* immaturus ellipsoideus, 2-locularis.

Tropical Africa. Portuguese E. Africa: Beira, *Rogers* 4551. S. Africa. Portuguese E. Africa: Inyamasan. *Schlechter* 12065

XLVII.—ENCEPHALARTOS WOODII.

(WITH PLATE.)

In the Annual Report on the Natal Botanic Gardens and Colonial Herbarium for the year 1906-07, p. 8, Mr. (now Dr.) J. Medley Wood, the Director, gave a brief account and a photograph of a "rare variety of *Encephalartos*" which had been discovered by him in Zululand a few years previously. Some living plants of the same species were collected in 1903 and again in 1907 by Mr. Wylie, the Curator of the Gardens. These were then planted in the Natal Gardens, and a leaf from one of the plants was forwarded to Kew, and provisionally determined as *Encephalartos Altensteinii*, Lehm., var. *bispinosa*, and the photograph in the report bore this name.

In an account of the new plants exhibited by Messrs. Sander and Sons, of St. Albans and Bruges, at the centenary exhibition of the Ghent Botanical and Horticultural Society, published in the Gardeners' Chronicle for 1908, lxiii. p. 257, the same species was described as *Encephalartos Woodii*, Hort. Sand. It was pointed out that for garden purposes, at any rate, the plant was as distinct from the variable *E. Altensteinii* as the other recognised species of the genus were from one another. The largest plant shown at the exhibition had a stem 18 ins. high and 8 ins. in diameter, with a handsome head of 25 leaves, which attained 5 ft. in length. The leaves were gracefully curved and furnished with leaflets of variable size, the largest being 8 ins. long and 2 ins. wide, arranged about 4 ins. apart in the lower portion of the rhachis, and more closely towards the apex, where they overlapped. The broadest leaflets were irregularly pinnatifid, the principal divisions and apex being spine-tipped. It was stated that the texture and bright shining green of the large leaves easily distinguished the plants from all other species of *Encephalartos*. It was said to grow well under cultivation, and to be a strikingly handsome plant.

In the same volume of the Gardeners' Chronicle, p. 414, Mr. Medley Wood gave a more detailed account of the discovery of the species, which we take the liberty of reprinting here:—

"In the year 1895 I was on a botanical collecting trip with wagon and oxen in Zululand, and having reached a spot where the country was very rough I stayed for several days botanising in the vicinity, and in so doing found a solitary clump of *Encephalartos*, consisting of four stems, the tallest of which was about 18 ft. high, with proportionate girth of stem, and with a few offsets at the base; the stems were all male, and not another plant of the species could be found in the vicinity, though we found a number of plants of *E. brachyphyllus*, of which we took away a number of specimens. Some years afterwards our Curator, Mr. J. Wylie, visited the locality, and I directed him to the place where these *Encephalartos* were. He brought back with him several of the smaller plants of the group, three of which were planted here, and in my report for 1906-7 I gave a photograph of one of them, with a very short note as to the habitat of the species. We have in the garden seven species of *Encephalartos*, and numerous

HUERNIA TRANSVAALENSIS.

[*To face page* 250.

ENCEPHALARTOS WOODII.

To face page **251**.]

specimens, but these three, as far as the foliage is concerned, are, in my opinion, not only the handsomest of all, but are strikingly different from any of the others, and I regret very much that such fine specimens as I saw should have been wantonly destroyed by the natives. I may conclude by saying that we have in the garden a plant, of which I believe there is a photograph in the Museum at Kew. It has been known as the 'Giant Encephalartos.' This plant is a male, and this year has no less than 18 cones, arranged in more or fewer complete concentric circles. I think that this is a record number; the trunk has been partly buried in the side of an embankment, and it is intended to remove it to a position where its full length can be seen to better advantage."

Quite recently Dr. Medley Wood has kindly forwarded to Kew a photograph of one of the two plants collected by Mr. Wylie in 1907, which we reproduce here. Dr. Medley Wood informs us that some of the examples grown in the Durban Gardens have now stems as high as 15 ft. or more, but as yet none of them have produced cones. Until these are forthcoming an adequate description is not possible.

The photograph of one of the plants in the Durban Gardens, here reproduced, was taken by Mr. W. D. Haygarth, and is of particular interest as it gives us also an excellent portrait of Dr. Medley Wood, whose sustained and untiring labours have done so much to increase our knowledge of the Flora of Natal.

XLVIII.—A NEW TROPICAL AFRICAN SARCOPHYTE.

J. HUTCHINSON.

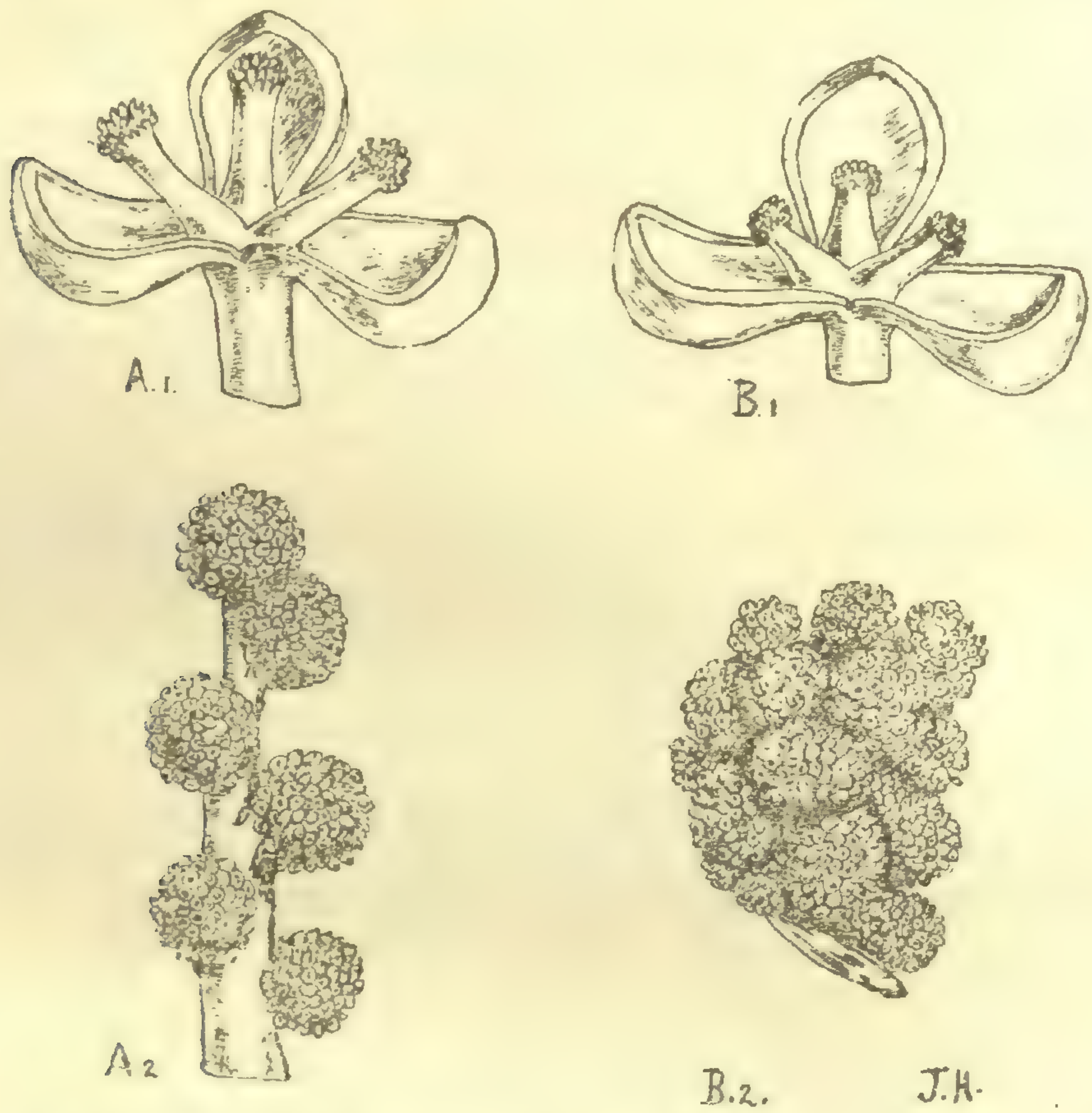
In the Flora of Tropical Africa vol. vi. i. p. 436, Hemsley expressed doubt as to whether the Tropical East African specimens of *Sarcophyte* (*Balanophoraceae*) referred by Engler to *S. sanguinea*, Sparrm., really belonged to that species, which was previously known to occur only in the neighbourhood of Grahamstown, South Africa. Hemsley observed that the Cape plant appeared to have a much more compoundly branched male inflorescence, but the material at his disposal was insufficient to decide the question and he had no alternative but to accept Engler's determination.

Thanks to the efforts of Mr. E. Battiscombe, Conservator of Forests, British East Africa, Kew has now received ample material, both male and female, of the East African plant, and the examination of these specimens and a photograph of them growing in their native habitat proves that they represent quite a distinct species. The collector of the new material is Dr. J. H. H. Pirie of the East African Medical Staff, after whom we have pleasure in naming the species. A second supply of specimens and a photograph were obtained by Mr. McGregor Ross, Director of Public Works, British East Africa.

Besides the difference in the branching of the male inflorescence observed by Hemsley, several other differences have been found

in both sexes which appear to be quite constant. These are shown in the following diagnoses of the two species:—

S. sanguinea, *Sparrm.* Male inflorescence compound, *i.e.*, the primary branches with short lateral branchlets bearing several flowers; bracts ovate or lanceolate-ovate; flowers mostly in pairs and fairly long-pedicellate, with the pedicels connate in their lower part; stamens from $\frac{3}{4}$ as long to nearly as long as the perianth segments (fig. A 1). Female inflorescence with the clusters of flowers loosely arranged and often shortly stalked (fig. A 2); diameter of the discoid stigma as great or nearly as great as that of the ovary, the latter being often completely hidden.—South Africa.



A. 1, Male flower of *Sarcophyte sanguinea*, × 4; A. 2, Branch of female inflorescence of same, nat. size; B. 1, Male flower of *S. Piriei*, × 4; B. 2, Branch of female inflorescence of same, nat. size. A. 1, after Hooker, remainder original.

S. Piriei, *Hutchinson*, sp. nov. Male inflorescence simply branched; bracts oblong or linear-oblong; flowers solitary, very shortly and stoutly pedicellate, or if in pairs then the pedicels not connate; stamens less than half as long as the perianth-segments (fig. B 1). Female inflorescence with the clusters of flowers sessile and densely crowded on the lateral branches (fig. B 2); diameter of the discoid stigma much less than that of the ovary, the latter always plainly visible.—British and German East Africa.

The relative length of the stamens and perianth-segments in

the male flowers appears to be the most important distinguishing character for the separation of the male plants of the two species, and the females may be readily recognised by the nature of the inflorescence. Even when quite young the heads of female flowers of *S. sanguinea* are laxly arranged and often shortly stalked on the lateral branches, and for a considerable time the discoid stigmas are closely pressed together and completely hide the ovaries beneath. Another character which may be of some importance is the presence of numerous bracts at the base of the male axis in *S. sanguinea*. There are none on the East African specimens and they are not visible on the photograph. In addition to the above differences *S. Pirïei*, according to Mr. Battiscombe, is quite odourless, whereas *S. sanguinea* is described as possessing a particularly obnoxious smell.

S. Piriei, *Hutchinson*, sp. nov. *Planta* omnino glabra, inodora. *Tuber* irregulariter lobatum, verrucosum, magnum. *Inflorescentia* ♂ usque ad 23 cm. longa et 10 cm. diametro, ambitu cylindrica; axis simpliciter ramosus, carnosus; rami dense dispositi, ascendentes, ad 4·5 cm. longi, floribus inclusis circiter 2 cm. diametro; bracteae oblongae vel lineari-oblongae, obtusae, 1·5–2 cm. longae, 0·6–1 cm. latae, chartaceae vel subcoriaceae. *Flores* ♂ solitarii vel geminati; pedicelli crassi, 2–3 mm. longi. *Perianthii* segmenta plerumque 3, rarius 2 vel 4, obovata, apice obtusa et cucullata, 4–5 mm. longa, 3–3·5 mm. lata, carnosa. *Stamina* perianthii segmentis vix dimidio brevioria. *Inflorescentia* ♀ ambitu subglobosa, circiter 12 cm. diametro; axis brevis, crassus; rami densissime dispositi, breves; capitula sessilia, globosa, in quoqe ramo circiter 10 disposita. *Flores* numerosi; ovarium in receptaculo immersum; stigma sessile, discoideum, ovarii latitudine dimidio angustius.—*S. sanguinea*, Engl. Pflanzenw. Ost-Afr. C 168; Hemsl. in Dyer Fl. Trop. Afr. vi. i. 436, excl. descr. of ♀ inflorescence, references and synonym, not of Sparrm.

Tropical Africa. British East Africa: Kibwesi, damp low forest at about 1010 m., on the roots of a thorn tree, *Scheffler* 361, ♂; *Scott Elliot* 6293, ♂; by the side of a stream on the Ngongo Bagas Hills near Nairobi, at about 1835 m., *Pirie in Herb. Battiscombe* 815, ♂; on the roots of an Acacia at the south end of the Ngongo Hills, about 1850 m., *McGregor Ross*, ♂ and ♀. Teita Hills, *ex Engler*. German East Africa: Ukami near Pangani, *ex Engler*.

XLIX.—NIGERIAN FUNGI: II.

E. M. Wakefield.

A small but very interesting collection of fungi has been received from Mr. C. O. Farquharson, Government Mycologist in the Nigerian Department of Agriculture. Mr. Farquharson has supplied notes as to the habitat of the fungi and other particulars with the specimens, and has also contributed the following remarks relating to ecological conditions.

"The collection has been made, roughly speaking, in three types

of country representing (1) Tropical Rain Forest, as found in the Government Forest Reserve at Ilugboro, (2) Tree Savannah or bush forest as found in the neighbourhood of Ibadan, and (3) Bush Savannah merging into tall grass savannah as found on the great plateau between Abeokuta and Meko, and its boundaries.

"In my journey through the Meko district, from Abeokuta to the town of Meko and from there south and eastwards through Aiyetoro, Ilaro, Ifo, Otta, and Agege, practically all these conditions were encountered. On a short tour through this district it is hardly possible to say that any particular types characterise the different formations, but what struck me especially about the high rain-forest country was the great scarcity of large fungi. From the humid conditions I was led to expect better things in this respect. Most of the forms appeared to be small and extremely delicate Agarics, *Polyporeae* like *Laschia*, a species closely resembling *L. lateritia* being not uncommon, and one or two *Phallinae* (*Dictyophora* sp. and *Phallus* sp.). . . .

"Even on trees which have been felled by the natives in making bush paths through the rain-forest, the forms encountered were few and not very interesting.

"*Polystictus xanthopus*, Fr. and *P. incomptus*, Fr. seem very tolerant of these conditions. The large *Fomes* with brown hymenium (*Fomes yucatanensis*, Murr.) was found in the Forest Reserve at Ilugboro, in two instances suggesting parasitism on their bush host. The gatherings sent are rather small, but specimens a foot or more across were observed. . . . No. 31 (*Polyporus Colossus*, Fr.) is found on the outskirts of high forest at Agege, but has been found also in great profusion in the more distinctly upland conditions at Ibadan, on decaying stumps of the Oil Palm.

"Of the Hexagonias collected, *H. discopoda* seems to be common in sub-rain-forest conditions. . . .

"The deep-pored Hexagonias were all found under bush savannah conditions on dead branches of small trees. How far this corresponds to their normal habitat I cannot say, as they are not sufficiently common. In the Meko-Aiyetoro district the rainfall probably would not greatly exceed thirty inches, and the short tornado season which marks the beginning and the end of the rains would account for a considerable proportion of the total. . . .

"On the decaying logs in farm clearings in the sub-rain-forest conditions such as obtain in the Cacao-growing districts certain forms are extremely common, notably *Polystictus cinnabarinus*, Fr., *P. Persoonii*, Fr., *P. occidentalis*, Kl., *Polyporus gilvus*, *Fomes lucidus*, *Schizophyllum commune*, Fr., *Polyporus lignosus*, Kl., the Para Rubber root disease, *Hymenochaete noxia*, Berk., of which small fructifications are not uncommon, and among the Ascomycetes *Daldinia concentrica*, Ces. et De Not., and various *Xylariae*. Under such conditions, too, in the wet season, there is a fairly extensive flora of Myxomycetes. Large ground *Pezizineae* seem to be very uncommon. The number of Agarics appears to be very few compared with what may be seen in Britain in localities that appear far less promising."

The following list includes specimens collected in the southern

Provinces of Nigeria by Mr. Farquharson, together with a few sent at various times by other correspondents and preserved in the Kew Herbarium. Some of the species were recorded previously (*K. B.* 1912, p. 141)—but additional notes or more correct nomenclature are now given.

Agaricaceae.

Lentinus Tuber-regium, *Fr.* Epicr., p. 392.
L. Woermanni, Cohn and Schroeter, in Abhandl. Naturw. Verein Hamburg xi. p. 4.
L. flavidus, Mass. in *Kew Bull.* 1901, p. 163.

A full description of this fungus, and its synonymy, has been given by Ramsbottom in the British Museum "Catalogue of Plants collected by Mr. and Mrs. P. A. Talbot in South Nigeria." The following additional notes, supplied by Mr. T. D. Maitland, formerly Curator in the Agricultural Department, as to the use of the sclerotium by natives, are of interest:—"The Ibo name is *Osu*, pronounced '*aw-so.*'" The Yoruba name is *Olú*, which simply means "mushroom," and is applied to several species of fungi. The sclerotia appear to be common in the bush, and most of the natives are familiar with them, and use them as food. They collect the *Olú* in the bush and bring it to the farm where they bury it in the ground. When required for use sufficient is cut off for immediate needs. They are also said to be able to cultivate it in this way, as small sclerotia brought from the bush readily grow and may attain the size of a football.

"To prepare the sclerotium for food it is first washed, then scraped into powder and boiled in soup along with fowl, fish, or other animal food.

"In Ogwashi, in the Central Province, the natives grind the sclerotia into powder, and mix it with the dye from Anatto seeds (*Bixa orellana*), making a paste of the compound with which they paint their bodies."

Polyporaceae.

Polyporus arcularius, (*Batsch*) *Fr.* Syst. Myc. i. p. 342.
Boletus arcularius, Batsch. Elench. Fung., p. 97.

A rather pale form. Similar specimens have been received from Sierra Leone. Agege. *T. D. Maitland* (1913).

Polyporus gilvus, (*Schw.*) *Fr.* Elench., p. 104.
Boletus gilvus, Schw. Syn. Fung. Car. Sup., p. 70.

Exceedingly common on decaying tree-stumps, both in upland bush forest and (more especially) in high forest. The species is very variable in habit, and sometimes tends to become perennial. *Farquharson* 10.

Polyporus Colossus, *Fr.* Nov. Symb., p. 56.
Ganoderma obockense, Pat. in Bull. Soc. Mys. Fr. iii. 1887, p. 119.
Polyporus Hollandii, Mass. in *Kew Bull.* 1901, p. 163.

A good series of entire specimens is sent. The species is a fairly common saprophyte in farm clearings in moist districts, but has been found in great profusion on felled Oil Palms at Ibadan.

It also occurs on Dicotyledonous trees. It grows out first as a great cushion of tissue, creamy-white in colour, gradually becoming bracket-shaped. The margin is sterile, thick, and white at first. The pores open rather late. When untouched the surface of the hymenium is white, but is easily bruised, and turns dark-greyish. When mature it sheds an enormous quantity of spores, which cover logs or grass beneath the fructifications with a brown coat. When fresh the fungus is almost spongy in texture, very moist and extremely difficult to dry satisfactorily.

Ibadan. *Farquharson* 31. A specimen has also been received from Sierra Leone.

Fomes lignosus, (*Kl.*) *Bres.* in Hedwigia 53, 1913, p. 60.
Polyporus lignosus, Kl. in Linnaea viii, 1833, p. 485.
Fomes semitostus, Auctt. (non Berk.).
Polyporus Auberianus, Mont. in Ramon de la Sagra, Hist. de l'Ile de Cuba, p. 399, tab. xvi. fig. 1.

The specimens show the great variability in habit of this species, from entirely resupinate forms to the thick perennial fruit bodies of a typical *Fomes*. One of the specimens was found on the Oil Palm (*Elaeis guineensis*); Petch states that it does not occur on Palms or Bamboos in Ceylon,* but it may be noted in this connection that it has been received from Singapore growing on Bamboos, and has also been recorded on monocotyledons in the Federated Malay States.

Fomes yucatanensis, (*Murr.*) *Sacc.* et *D. Sacc.* Syll. Fung. xvii. p. 116.
Pyropolyporus yucatanensis, Murr. in Bull. Torr. Bot. Club, xxx. 1903, p. 119.
Xanthochrous rudis, Pat. in Bull. Soc. Myc. Fr. xxiii. 1907, p. 83.
Polyporus rudis (Pat.) Sacc. et Trott. Syll. Fung. xxi. p. 269.

Pileus of varying size, from 4 inches to a foot or more wide, and up to 8 or 9 ins. across, applanate or sometimes more or less triangular in section, but never truly ungulate. Surface covered with a horny crust, at first deep umber-brown, velvety pubescent, deeply concentrically furrowed, later becoming blackish, rough, and cracked. Margin paler, obtuse. Flesh radiating, colour of flesh and tubes "antique brown" (Ridgway 17 O.Y., k). Pores minute, deep brown. Spores brown, subglobose or elliptical, 5 × 4–4·5 μ. Setae usually present, abundant, 5 μ diameter, projecting 12–15 μ. Two specimens of this collection show no setae, while possessing abundant spores. These may possibly be conidial forms. The species is close to *Fomes rimosus*, but is distinguished by the much more yellow-brown colour of the flesh, the velvety surface, and the presence of setae in the pores.

In moist, high forest, growing at the base of trees, and possibly parasitic. Meko-Aiyetoro. *Farquharson* 28.

Fomes pachyphloeus, *Pat.* in Journ. de Bot. iii. 1889, p. 257, and in Bres. Bull. Soc. Myc. Fr. 1890, p. xli.

* Petch: Trop. Agriculturist, Aug. 1912, p. 155.

A very large specimen; judging from the portion sent the entire fruit-body must have been nearly 2 ft. wide.

Distr. Akwa, Agolo, Obu. *N. W. Thomas* (1911).

Polystictus (Amaurodermus) sericatus, *Lloyd*, Syn. Stip. Polypor. p. 120.

Old Calabar, *J. H. Holland* (1900).

Previously referred to *Fomes rugosus*, from which it differs in the more slender habit, shining, silky pileus and fine, seal-brown pores. A second specimen of this graceful species has recently been received from Uganda.

Polystictus incomptus, *Fr.* Nov. Symb., p. 73.

P. Holstii, P. Henn. Pilz. Ostafr., p. 57, in Engler, Die Pflanzenwelt Ost-Afr.

Agege. *Maitland*. In very moist situations, by the side of streams, *Farquharson* 30.

Polystictus flabelliformis, (*Kl.*) Fr. Nov. Symb., p. 74.

Polyporus flabelliformis Kl., in Linnaea viii. 1833, p. 483.

On a partially submerged log, Ilugboro, *Farquharson* 11.

Polystictus modestus, (*Kze*) *Cke.* in Grevillea xiv. 1885, p. 79.

Polyporus modestus, Kze, in Fries, Linnaea v. 1830, p. 519.

Polystictus albo-cervinus (Berk.), Cke. in Grevillea xiv, 1885, p. 79.

Polyporus albo-cervinus, Berk. in Hook. Journ. Bot. viii. 1856, p. 234. Between Aiyetoro and Ilaro. On decaying wood in rain-forest, *Farquharson* 9.

Polystictus vittatus, (*Berk.*) *Cke.* in Grevillea xiv. 1885, p. 84.

Polyporus vittatus, Berk. in Hook. Lond. Journ. Bot. vi. 1847, p. 505.

Daedalea pavonia, Berk. l.c. p. 507.

The specimens are very much larger than the type, but appear to belong to this species. Pileus sessile, rather thick, fleshy when fresh, margin obtuse. Upper surface clay to pale greyish, with faint darker greyish zones, minutely velvety under a lens, more or less rugulose and with alutaceous felt behind. Hymenium white when fresh, ochraceous when dry; pores of medium size, edges thick and blunt. Spores not seen.

Ibadan. Common in wet season on decaying logs, *Farquharson* 12.

Polystictus obstinatus, *Cke.* in Grevillea xiv. 1885, p. 83.

Trametes obstinatus, *Cke.* in Grevillea xii. 1883. p. 17.

Fairly common on decaying logs. Usually covered with green algae, etc. *Farquharson* 25.

Polystictus occidentalis, (*Kl.*) *Fr.*, Nov. Symb. p. 90.

Polyporus occidentalis, Kl. in Linnaea viii. 1833, p. 486.

Very common on dead trees, and very variable in habit. Like *Polyporus gilvus* it occasionally shows a tendency to become perennial. *Farquharson* 27.

Polystictus beharensis, *Berk.* in Hook. Journ. Bot. vi. 1854, p. 163.

A beautiful species, near to *P. rigidus*, but differing in the darker, narrowly zoned pileus, and distinctly thin and flexible, not rigid substance.

Very broadly effused along the whole length of a dead piece of branch, margin reflexed. Pileus chestnut brown with narrow darker zones, velvety or silkily tomentose. Flesh very thin, pale brown. Pores very shallow at first, later becoming slightly deeper, and elongated if growing on a vertical surface, pale yellowish avellaneous, 0.3-0.5 mm. in diameter. In section the tissue of the pore walls is filled with rather large crystals of calcium oxalate. The dark-brown hyphae forming the surface of the pileus are sharply marked off from the paler hyphae composing the trama.

Ilugboro. In high forest, *Farquharson* 32; *Maitland* (1913).

Irpex flavus, *Kl.* in Linnaea viii. 1833, p. 488.

Very common. Saprophytic on decaying trees in high forest where there is plenty of moisture, *Farquharson* 26.

Poria Ravenalae, *B. and Br.* in Journ. Linn. Soc. xiv. 1875, p. 53.

Polyporus Büttneri, P. Henn. in Verh. Bot. Ver. Prov. Brand. xxx. 1888, p. 129.

A very distinct species in the steel-grey colour, and irregular shallow pores. Subhymenial hyphae dark-brown, rather rigid, 1·5–2 μ in diameter, running erect and parallel to one another in the walls between the pores in a very characteristic manner. Hymenial elements hyaline. Spores hyaline, cylindrical, 8–10 × 2·5 μ. Apparently confined to monocotyledons. Now known to occur on *Ravenala*, Bamboos, *Cocos*, and *Elaeis*, in Ceylon, Brazil, and Tropical Africa.

Ibadan. Common in moist places on decaying leaves of Oil Palm at latter end of wet season, *Farquharson* 1.

Trametes punicea, *Fr.* Nov. Symb. p. 98 (1851).

Distinct from *Trametes cinnabarina*, Jacq. in the larger pores, which have a tendency to become daedalecid, and in the darker colour of all the parts. It appears to be a very rare species, and was first described by Fries from Malaya.

Pileus sessile, 3–7 cm. broad by 2–4·5 cm. across, and up to 2 cm. deep behind, cinnabar-red at the obtuse margin, but becoming deep-crimson to blackish behind; surface smooth, not zoned, sometimes radiately rugulose. *Pores* 0·5–1 mm. in diameter, and up to 1 cm. deep behind, cinnabar to dull blood-red, irregular, walls thin, edges obtuse. *Flesh* cinnabar-red, with a dull rusty tinge, 3–6 mm. thick, zoned. *Spores* hyaline, elliptical, 4–5 × 2 μ. *Hyphae* 2–5 μ.

Between Meko and Aiyetoro. On logs in farm clearings, not common, *Farquharson* 15.

Trametes cingulatus, *Berk.* in Hook. Journ. Bot. vi. 1854, p. 164.

Trametes picta, Berk. in Trans. Linn. Soc. ser. 2, ii. 1882, p. 61.

Polyporus argentatus, Cke. in Grev. xv. p. 20.
Polystictus albidus, Mass. in Journ. Bot. 30, 1892, p. 162.
P. villosus, Mass. in Kew Bull. 1906, p. 93.
Ibadan. Common on decaying logs, *Farquharson* 13.

Trametes badia, *Berk.* in Hook. Lond. Journ. Bot. i. 1842, p. 151.
Allied to *Polyporus strigatus*, B., and *Trametes hydnoides*, Fr.
Meko-Aiyetoro. Growing mixed up with *Hexagonia Sacleuxii*, *Farquharson* 29.

Hexagonia hirta, (*Pal.*) *Fr.* Eiper, p. 496.
Favolus hirtus, Pal. Fl. d'Ow. et de Benin, 1804, p. 1, tab. 1.
The four gatherings sent illustrate the extraordinary variability of this species, both as to general habit and pore-size. The pileus varies from thick, rigid, with regular obtuse-walled pores, to thin and fragile, with thin-walled irregular pores, tending to become irpicoid. The pore-size varies from 1 to 3 mm. in diameter, or occasionally larger by imperfect development of a dividing wall, all gradations occurring.
Near Meko. *Farquharson* 16, 17, 19, 20.

Hexagonia Dybowskii, *Pat.* in Bull. Soc. Myc. Fr. 1892, p. 54.
A rare species, first described from the Congo, and since recorded by Bresadola from the same locality and by Patouillard from French Guinea. In its pale colour and general habit it is closely allied to certain species of *Polystictus*, as *P. cristatus*, Cke.
Near Meko, on a fallen log. *Farquharson* 14.

Hexagonia Pobeguini, *Har.* in Bull. Soc. Myc. Fr. viii. 1892, p. 28.
Hexagonia Stuhlmanni, P. Henn. in Engl. Jahrb. xvii. 1893, p. 29.
Between Meko and Aiyetoro, on a small dead tree in bush savannah, October, 1913. *Farquharson* 18.

Hexagonia Sacleuxii, *Har.* in Journ. de Bot. vi. 1892, p. 19.
Between Meko and Aiyetoro, October, 1913, *Farquharson* 21.

Hexagonia discopoda, *Pat. et Har.* in Bull. Soc. Myc. Fr. ix. 1893, p. 209.
These specimens are truly intermediate between *H. discopoda* and *H. Dregeana*, Lév., and render it difficult to say whether these two species can be maintained. They have the more or less sessile habit of *H. Dregeana*, with the small pores of *H. discopoda*, while the colour varies from uniformly dark in some specimens to the two-coloured type of *H. discopoda* in others.
Fairly frequent in moist districts under high bush formations. Agege, Otta, Ibadan, etc., *Farquharson* 22.

Thelephoraceae.

Stereum Schomburghii, *Berk.* in Journ. Linn. Soc. xiii. 1873, p. 168.
Hymenochaete olivaceum, Cke. in Grevillea xiv. 1885, p. 11.
Broadly effused, margin reflexed. Hymenium velvety, general-colour dull olive-brown ("Saccardo's Umber", Ridgway

17 O.Y., k). Sterile outgrowths in hymenium of two kinds, (1) slender rough-walled cystidia, cylindrical, apex blunt, 4–5 μ wide, hyaline at apex, pale brownish below; (2) larger smooth-walled hairs, cylindrical, apex blunt, 6–8 μ wide, occasionally 2–3 septate, pale olive-brown. Basidia and spores not seen. Basal hyphae loosely interwoven, olive-brown, 3–4 μ.

Ibadan. Common on old stumps by the side of streams. *Farquharson* 3.

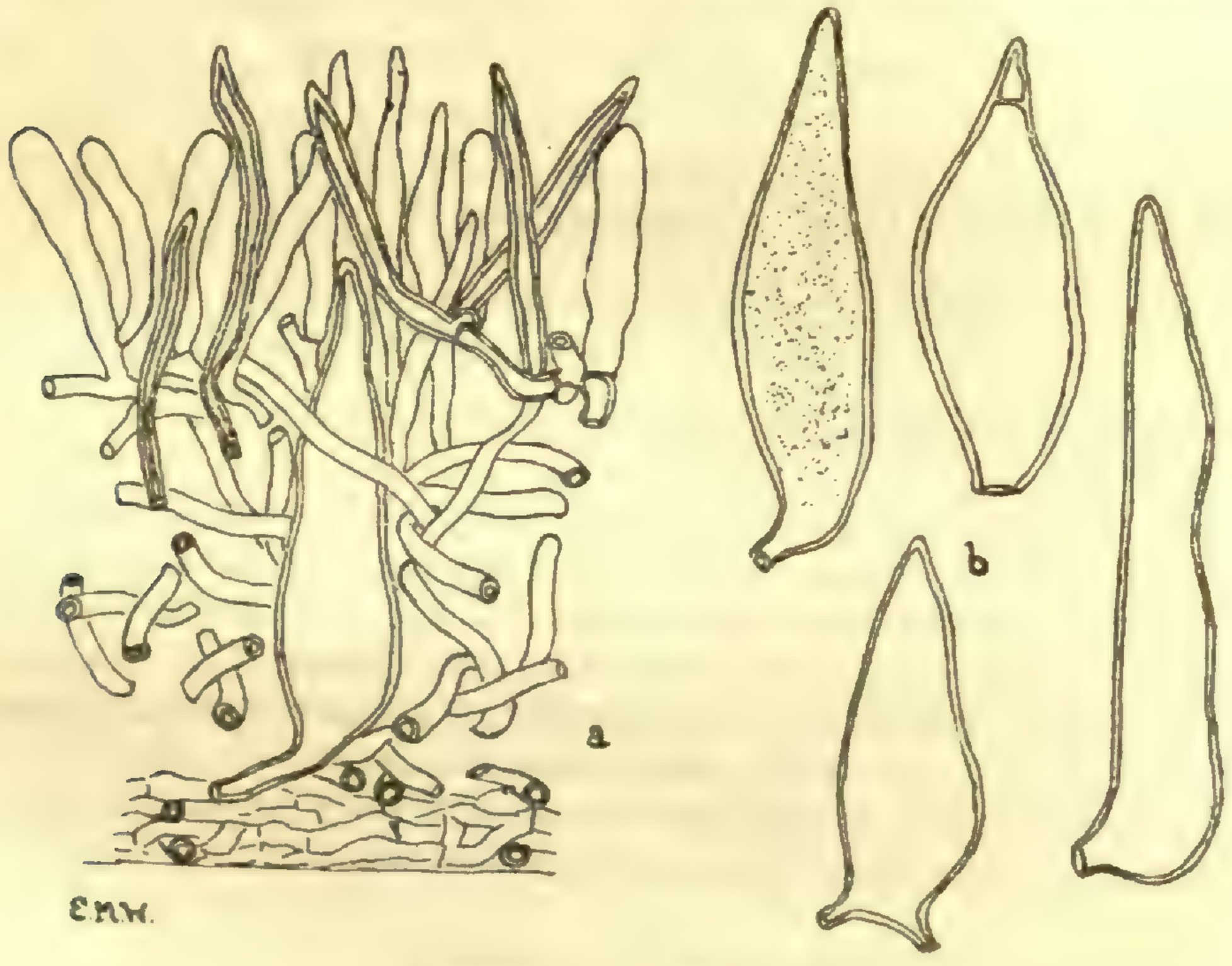
The margin when fresh is white.

Hymenochaete castanea, *Wakefield*, sp. nov.

Sporophore late effusum, tenuum, arcte adanatum, minute velutinum, castaneum, ambitu, pallidius. *Setulae* densae, subuliformes, brunneae vix ab hyphis diversae. *Cystidia* omnino depressa, fusiformia, laevia, tenuiter tunicata, interdum basi bifurcata, flavidula, 47–80 × 11–18 μ. *Basidia* hyalina vel dilute colorata, 27–30 × 5–7 μ. *Sporae* non visae. *Hyphae* subhymeniales laxe intertextae, brunneae, 3·5–4 μ diametro. *Hyphae* basales vix distinctae, conglutinatae, flavido-brunneae.

Nigeria. Ibadan: ad folia palmarum et ad ramos emortuos *Theobromae Cacao*, *Farquharson* 5, 33.

A remarkably distinct species, marked by the very thin, finely velvety fruit-body, and the rich chestnut colour, varying from "chestnut-brown" (Ridgway 11[1] Orangem), to a much darker shade. In structure it is remarkable for the very slender setae, and the presence of sunken laticiferous bodies or "gloeocystidia," such as occur in various other genera of *Thelephoraceae*. These cystidia occasionally show one or two septa near the pointed apex.



Hymenochaete castanea.

a. Vertical section of sporophore.
b. Various forms of embedded cystidia.

Hymenochaete noxia, *Berk.* in Herb.

Tissue thick, compact, of closely agglutinated brown hyphae,

2–2·5 μ in diameter. Setae long, gradually tapering above, up to 10 μ wide at thickest part, projecting up to 40 μ. Spores not seen.

Ibadan. On bush stumps, and on *Cajanus indicus*, *Farquharson*.

SPHAERIACEAE.

Xylaria involuta, (*Kl.*) Cke in Grevillea xi. 1883, p. 82.
Sphaeria involuta, Kl. in Herb. Hook.
Sphaeria Telfairii, Berk. in Ann. Nat. Hist .iii. 1839, p. 397.
Xylaria Telfairii, (Berk.) Fr.Nov. Symb. 1851, p. 127.
Xylaria tabacina, (Kickx.) Fr.Nov. Symb. 1851, p. 127.
Xylaria gigantea, (Zipp.) Fr.i.c. p. 127
Spores 14–16 × 6–7 μ.
On decaying wood, Ibadan, Ilugboro, *Farquharson* 37.

Thamnomyces Chamissonis, *Ehrenb.* in Nees, Horae Physic. Berolinens, 1820, p. 79, tab. xvii, fig. 1.
Spores 16–21 × 7–9 μ.
Farquharson (1913). Also received from the Gold Coast and Uganda.

Glaziella splendens, *Berk.* (?) in Cke. Grevillea xi. 1883, p. 83.
Xylaria splendens, Berk. in Journ. Linn. Soc. x. 1869, p. 382.
No mature spores are present in the perithecia either of these specimens or of the type of *G. splendens*. The plant is referred to this species on account of the similarity of microscopic structure, which resembles that described by Patouillard* for his *Sarcoxylon aurantiacum*, which may therefore be a synonym. The fructification when fresh is covered externally by a bright, sulphur-yellow, furfuraceous layer. Beneath this is a black zone, in which the perithecia are immersed, and the innermost layer is pale and gelatinous, traversed by dark bands radiating inwards from the black zone. The centre of the fructification is hollow and, when fresh, filled with water.
On wood, *Farquharson*, 35.

L.—MISCELLANEOUS NOTES.

MR. A. WAINWRIGHT, MR. J. E. T. HARTLEY.—Mr. A. Wainwright, of Queens' College, Cambridge, and Mr. J. E. T. Hartley, of Magdalene College, Cambridge, have been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendents of Agriculture in Nigeria.

MR. C. H. OLDHAM.—Mr. C. H. Oldham, lately a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, a Sub-Inspector for the purposes of the Destructive Insects and Pests Act under the Board of Agriculture and Fisheries.

* Patouillard. Bull. Soc. Myc. Fr. xxvii. 1911, p. 331.

Mr. W. N. C. Belgrave.—Mr. W. N. C. Belgrave, B.A., of St. John's College, Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Mycologist in the Department of Agriculture, Federated Malay States.

Nymphaea stellata in the open.—For several months during the summer some plants of *Nymphaea stellata* with blue flowers have made a very pleasing display in the Water-lily Pond, situated near the Southern Pinetum. There is grown here a good selection of the ordinary species and hybrid varieties, which give a charming variety of colours—white, pink, yellow and crimson. From them the blue one is distinct in three notable respects: in colour, in the flowers standing 1 to 2 feet out of the water, and in their remaining fully open through the afternoon. The last is a rather important qualification in a public garden chiefly frequented during the afternoons.

Nymphaea stellata is not, of course, genuinely hardy, and the plants grown in this pond are not put out until early June, the tubers being housed during the winter and started into growth under warmth in spring. But where conveniences for this winter and spring protection exist, the blue water-lily is evidently well worth experimenting with as a summer aquatic in the open air. At Kew they have for several years past kept up a continuous show in this Pond for three or four months; and in full season from eight to over a dozen flowers may often be counted open at one time on a plant. This pond is slightly warmed by an inflow of condensed steam, etc., from a pumping engine, but this can have little effect on the water at the opposite end, 30 or 40 yards away, where a plant of the blue water-lily is blossoming excellently.

It should be understood that the *N. stellata* of European Water-lily collections is not the plant known to Indian botanists as *N. stellata*.

W. J. B.

Abnormal Condition of the Wood of Thuya plicata.—In the spring of 1913 a log of wood from the base of a recently-felled tree of *Thuya plicata* was presented to the Forestry Museum at Kew by Mr. Reginald N. Rogers, of Carwinion, Falmouth. On arrival it was seen that growth had been rapid, but there was nothing to indicate any abnormality, and it was not until after the log had been cut into three longitudinal sections, some three months later, that any peculiarity was noticeable. After leaving the saw, the wood was placed in an open shed to season, and a few weeks later curious longitudinal depressions had formed in the surface of each piece, whilst numerous tiny cracks were to be seen in the transverse sections. By January, 1914, considerable shrinkage had taken place, and the surface of each longitudinal piece presented a ridged appearance, the channels in some cases being nearly a quarter of an inch deep. At the same time the cracks in the transverse faces had broadened at the base, so forming roughly triangular fissures. At this time the surfaces were planed, and it was found that the fissures extended for a considerable distance

into the wood, suggesting in appearance the galleries of boring insects.

An idea of the appearance of the wood at the present time may be gleaned from the fact that in two separate areas, each 3 inches square, the fissures number 31 and 52 respectively. In most instances they are still roughly triangular, and the base varies in length from $\frac{1}{12}$ to $\frac{7}{12}$ of an inch, about $\frac{1}{6}$ of an inch being the average. In very few cases do the fissures extend through the autumn wood, though here and there are found evidences of a tendency for the summer and autumn wood to separate. The depth and straightness of the fissures can be appreciated from the fact that in a log $3\frac{1}{2}$ feet in length a wire can be easily inserted to a depth of from 12 to 25 inches in many of the holes.

The present condition of the wood appears to be due to local shrinkage during drying and to be connected with abnormal softness and weakness of certain parts. Rapid growth encouraged by mild and moist atmospheric conditions may have been responsible for undue softness of the summer wood. The tree had been grown as an ornamental specimen and was said to have been about 80 feet high. At $3\frac{1}{2}$ feet from the ground the trunk measured 25 inches in diameter and showed 48 annual rings. The rings vary a good deal in width not only between those of different years, but the same ring varies in different parts of the circumference. Thus, whilst a ring in the depressions of the trunk, which occur between the swellings corresponding with the buttresses, may be but $\frac{1}{8}$ of an inch wide, the same ring in another place may be from $\frac{5}{12}$ to $\frac{7}{12}$ of an inch wide.

In weight the wood is about $22\frac{1}{2}$ lbs. to the cubic foot. Hough gives the weight of native grown wood as 23·66 lbs. per cubic foot.

From the fact of the wood of this tree being of considerable value in Western North America and of the species growing well in many parts of the British Isles, it has been planted rather extensively in some places under the various names of *T. plicata*, *T. gigantea* and *T. Lobbii*, for silvicultural purposes. It would, however, be well to make a thorough investigation of the wood from various parts of the country in order to prove whether it is really likely to be of commercial value after it is grown before further extensive plantings are made. Very fair samples of wood have been received from Western Scotland which, after seasoning for several years, are quite sound, but in a specimen grown in Devonshire a few triangular fissures occur. In Ireland it is said to grow well for a certain time and to form good scaffold poles and pit props, but as the tree advances in age the wood is apt to be troubled by heart rot. So far as can be seen at present, inferior wood is to be expected from trees growing under very mild climatic conditions where the atmosphere is heavily charged with moisture.

W. D.

Botanical Magazine for September. -The plants figured are *Echinopanax horridus*, Dene and Planch. (t. 8572); *Hamamelis vernalis*, Sargent (t. 8573); *Pimelea ferruginea*, Labill. (t. 8574); *Aconitum rotundifolium*, Kar. and Kir. (t. 8575), and *Tillandsia Benthamiana*, Klotzsch, var. *Andrieuxii*, Mez (t. 8576).

Echinopanax horridus is one of several names for a striking Araliaceous plant which is a native of the coast and islands of North-West America from Sitka and the Charlotte Sound to the Oregon, the borders of California and the Rocky Mountains; also of Japan, where Professor Sargent has observed it growing freely in the dense shade of the hemlock spruce forests. In Japan it is known as Ari Bouki. It is a shrub, growing from 3 to 10 feet high, with a prickly stem, creeping below and leafy at the top, furnished with palmately 5–9-lobed leaves, 6–10 inches across. The plate was prepared from a plant purchased in 1909 from Messrs. Lemoine of Nancy. At Kew it is necessary in the spring to protect the young growths from frost.

The *Hamamelis* is a native of the South-Eastern United States, and though closely allied to *H. virginiana*, Linn., the time of flowering, from midwinter to spring, is the same as that of *H. japonica*, Sieb. and Zucc. It may also be distinguished from *H. virginiana*, which flowers during the autumn, while still in full leaf, by the habit of spreading by stolons, by having the calyx-lobes red on the inner face and a more abundant and persistent pubescence on the twigs and leaves, the latter of which are dull and rather glaucous beneath. As a garden plant it has not so far proved so attractive as the Chinese and Japanese species. It was first received at Kew in 1909 from the Arnold Arboretum.

The *Pimelea*, a West Australian plant, was first introduced in 1824, and figures of it are met with in various works under the names of *P. decussata*, R. Br. and *P. diosmifolia*, Lodd. Its flowers vary in colour from pale pink to a rather deep red, and are arranged in terminal globose heads, each of which has four subtending greenish-pink bracts about $\frac{1}{3}$ inch long. A distinctive appearance is imparted to the inflorescence by the presence of spreading white hairs on the lower part of the perianth-tube.

Aconitum rotundifolium is one of the most characteristic species from Western Central Asia, where it is sometimes found growing at an altitude of 17,000 feet above sea-level. It has unusually small tubers which, on tasting, do not produce the tingling sensation caused by poisonous aconites. The inflorescence is a raceme or narrow panicle and is pubescent or villous. The flowers are about $\frac{3}{4}$ inch long, and are greenish-white with violet veins, somewhat flushed with purple or violet. A plant from which the figure was prepared was purchased in 1912 from Messrs. Regel and Kesselring, of St. Petersburg, under the name of *A. albo-violaceum*, which is a species of a different section.

The *Tillandsia* has been figured from a plant sent to Kew in 1912 by Mr. C. H. Lankester, Cachí, Costa Rica. It was first discovered at Chalco in Mexico by Mr. G. Andrieux. It occurred as an epiphyte on a *Quercus* and is distinguishable from the typical form by the smaller flowers, purple petals, shortly acute sheath of the scape, and by the upper bracts being rounded at the apex.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8] [1914

LI.—ECHIUMS FROM THE ATLANTIC ISLANDS: II.

T. A. Sprague.

(WITH PLATES.)

The Echiums of the Canary Islands and Madeira were arranged by Christ* in four Series, *Simplicia*, *Virescentia*, *Gigantea*, *Stricta*, according to whether the stem was simple or branched, and to the nature of the inflorescence. De Coincy,† on the other hand, used the annulus inside the corolla and the indumentum as the basis of his classification, and placed side by side species which differ greatly in habit.

Christ's divisions seem to be more natural, and are adopted as the basis of the provisional classification given below. *E. callithyrsum* has a branched stem,‡ and is therefore transferred from the *Simplicia* to the *Virescentia*.

Ser. I. Simplicia, *Christ.*

Subseries A. **Latifolia.** Folia lata, ovato-lanceolata vel lanceolata: *E. simplex*, *E. Pininana*.

Subseries B. **Angustifolia.** Folia angusta, lanceolato-linearia: *E. Auberianum*, *E. Wildpretii*, *E. Perezii*.

Ser. II. Virescentia, *Christ.*

E. virescens, *E. nervosum*, *E. candicans*, *E. Webbii*, *E. hierrense*, *E. onosmaefolium*, *E. callithyrsum*.

Ser. III. Gigantea, *Christ.*

Subseries A. **Sericea.** Folia plus minusve sericea: *E. giganteum*, *E. leucophaeum*, *E. Bond-Spraguei*, *E. breviramе*, *E. aculeatum*, *E. hypertropicum*.

Subseries B. **Tuberculata.** Folia valde tuberculata, haud sericea: *E. Decaisnei*, *E. gentianoides*, *E. nudum*.

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* Engl. Jahrb. vol. ix. p. 126 (1888).
† Bull. Herb. Boiss. ser. 2, vol. iii. p. 263 (1903).
‡ Bolle in Ind. Sem. Hort. Berol. 1867, App. p. 6.

(3424.) Wt. 225–595. 1,125. 9/14. J. T. & S. G. 14.

Ser. IV. Stricta, *Christ.*

E. strictum, E. exasperatum, E. stenosiphon.

The present article deals with the species assigned to Ser. *Simplicia*, Subser. *Angustifolia*. *Echium Auberianum* was described by Webb and Berthelot in their Phytographia Canariensis, sect. iii. p. 42 t. 144 (1836–50), and was based on a specimen collected by P. A. Auber on the Montaña Blanca at the foot of the upper cone of the Pico de Teyde, Tenerife.

A second species, *E. Bourgaeanum*, Webb, was collected by H. de la Perraudière above Guimar, Tenerife, at 2200 m., and in the Cañadas, in April and July, 1855. This was distributed in Bourgeau's Plantae Canarienses, 1 895 and 2 1436, but was never published by Webb, and was reduced to *E. Auberianum* by Christ in 1888.* In 1903 it was described and carefully distinguished from *E. Auberianum* by De Coincy.†

In the previous year, however, the same species was described by Sir J. D. Hooker‡ under the name *E. Wildpretii*, H. H. W. Pearson, from a plant raised at Kew from seeds received from the late Mr. H. Wildpret. This particular plant was poorly developed, and had a thin thyrse in which the lateral cymes were exceeded by their subtending bracts. Plants subsequently raised at Kew under different treatment produced a dense thyrse with lateral cymes exceeding the bracts. According to information since received from Dr. G. V. Perez, the seeds of *E. Wildpretii* were gathered at El Sombrerito above Vilaflor, south of the Peak of Tenerife, at an altitude of about 8,000 ft.

A third species, *E. Perezii*, Sprague, a native of Palma, was described in *Kew Bull.* 1914, p. 210. This agrees in many respects with *E. Wildpretii*, from which it may be distinguished by the broad lax inflorescence, longer style-arms and other characters. *E. Perezii* is quite different in habit from *E. Wildpretii*, as may be seen from the accompanying plates of the two species growing in Dr. Perez's garden at Villa Orotava.

Echium Auberianum appears to be a very rare plant, whereas *E. Wildpretii* (*E. Bourgaeanum*) is known from several localities. *E. Auberianum* was first discovered in 1778, by Masson,§ and was recognised as a new species by Solander, who made the following notes:—"Echium caule herbaceo foliisque lanceolatis strigosissimis aveniis staminibus corollae aequantibus. Habitat in Tenerife insula canariensi locis arenosis inter juga montium. Fr. Masson 1778." Masson's specimen of *E. Auberianum* is perhaps the finest extant; it is preserved in the British Museum herbarium. Through the kindness of Prof. Schröter in lending the *Echium* material preserved in the Botanical Museum of the Zürich Polytechnikum, a third specimen of the true *E. Auberianum* has come to light. This was collected at La Fortaleza, 2160 m., above Orotava, during the expedition to the Canary Islands conducted by Professors Rikli and Schröter in 1908. The

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* Engl. Jahrb. vol. ix. p. 126.
† Bull. Herb. Boiss. ser. 2, vol. iii. p. 2.
‡ Bot. Mag. t. 7847 (Aug. 1902).
§ Vide Webb and Berth. Geogr. Bot. p. 81.

ECHIUM WILDPRETII.

[*To face page* 266.

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ECHIUM PEREZII

To face page 267.]

material consists merely of the base of a plant, without flowers, and much eaten by goats, but the leaves exhibit the stiff hairs and strong tubercles so characteristic of *E. Auberianum*, and there can be little doubt as to the identification. It is to be hoped that the species still survives in this locality.

Echium Wildpretii and *E. Perezii* are characterised by a strictly actinomorphic rose-coloured corolla, and long-exserted straight filaments, which radiate regularly from its mouth.

E. Auberianum is unknown in a living state; Webb and Berthelot described the corolla as blue, but this was presumably from dried material. The corolla appears to be very slightly zygomorphic; the three posterior stamens are included, and the two anterior are shortly exserted.

It should be stated that the foregoing notes are the result of an investigation commenced in 1912 on the instigation of Dr. Perez, who has sent dried specimens and photographs of *E. Wildpretii* and *E. Perezii to* Kew, and afforded valuable assistance in other directions.

Key to the Species.

Leaves hispid, strongly tubercled ... 1. *E. Auberianum.*

Leaves silky:

Style-arms 0·7 mm. long ... ... 2. *E. Wildpretii.*

Style-arms 1·8 mm. long ... ... 3. *E. Perezii.*

1. **E. Auberianum,** *Webb and Berth.* Phyt. Canar. sect. iii. p. 42, t. 144; Christ in Engl. Jahrb. vol. ix. p. 126 (excl. *E. Bourgaeanum*, Webb); De Coincy in Bull. Herb. Boiss. ser. 2, vol. iii. p. 488.

Tenerife. Montaña Blanca, *Auber* (Herb. Paris); in sandy places between mountain ridges, *Masson* (Mus. Brit.); La Fortaleza, 2160 m., *Rikli and Schröter Expedition* (Zürich Polytechn.).

2. **E. Wildpretii,** *H. H. W. Pearson ex Hook f.* in Bot. Mag. t. 7847 (1902); Gard. Chron. 1905, vol. xxxviii. p. 5 fig 4; l.c. 1912, lii. p. 317, Suppl. Ill.; E. Jahandiez in Rev. Hort. 1914, p. 349, fig. 109. *E. Bourgaeanum*, Webb ex De Coincy in Bull. Herb. Boiss. ser. 2, vol. iii. p. 275; H. Schenck, Veg. Canar. Ins. p. 393, fig. 69; Bois in Bull. Soc. Acclimat. 1912, p. 719, fig. 3; Perez in Gard. Chron. 1913, vol. iiii. p. 19, fig. 16. *E. Auberianum*, Perez in Rev. Hort. 1912, p. 440, fig. 151, non Webb et Berth.

Tenerife. Above Guimár, at 2200 m., fl. April 4, *Perrandière*; Cañadas, fl. and fr. July 4, Bourgeau II. 1436; Cañadas: Los Azulejos, 2200 m., fl. June, *Burchard* 164 (Zürich Polytechn.); El Sombrerito, above Vilaflor, about 2400 m., *Wildpret's Collector.*

3. **E. Perezii,** *Sprague* in Kew Bull. 1914, p. 210.

Palma. Punta Llana: Barranco del Agua, *Dr. Santos's Collector.*

The photographs of *E. Wildpretii* and *E. Perezii* reproduced on the plates were taken by Mr. M. Benitez.

LII.—NOTES ON FRUIT-GROWING IN THE EAST AFRICA PROTECTORATE.

H. Powell.

The pioneering of fruit-growing on systematic lines in the early days of the East Africa Protectorate is largely due to the late Rev. Stuart Watts, of the N'gomeni Mission Station, at Mackakos, Ukamba Province.

Here, for 20 years, Mr. Watts devoted a good deal of attention to establishing what are popularly known in East Africa as European fruit trees, such as apple, plum, peach, apricot, etc.

Fruit trees were also introduced to N'gomeni from other countries outside of Europe, and in the course of time, by means of acclimatisation and selection, varieties of the several fruits were established, best suited to the climatic conditions prevailing at N'gomeni.

Ever since the establishment of the Department of Agriculture in 1903 the importance of fruit culture was recognised, and on the founding of Experimental Stations at Mazeras and Kibos the introduction, cultivation and distribution of improved varieties of tropical fruit plants has been actively carried on.

Similar attention is being given to temperate and sub-tropical fruits at the Government Experimental Farm, Kabete.

Settlers and private persons have also devoted, and are continuing to give, close attention to fruit culture throughout the Protectorate, so that ultimately data will be obtained in regard to soil and climatic conditions needed for the production of a great variety of fruit.

Frequently intending settlers are desirous among other things of obtaining information regarding fruit growing in the Protectorate, and these "Notes on Fruit Growing" by one who has had upwards of 10 years' experience in the subject in various parts of the country may perhaps be useful and interesting.

In an appendix a list is given of the fruits under trial on a property known as Mbali Sana, in the Lumbwa District of the Nyanza Province.

Apple (*Pyrus Malus*).—Though fairly successful at N'gomeni, apple-growing, judged from a European standpoint, cannot be regarded as satisfactory, but as time goes on and the trees become more acclimatised they may adapt themselves to local conditions and better results be obtained.

Avocado Pear (*Persea gratissima*).—This, as is well-known, has no affinity whatever with the ordinary pear. The tree grows vigorously and produces huge crops of fruit at Parklands, a suburb of Nairobi. Younger trees, but equally vigorous, are established in the Kedong Valley, Naivasha Province.

Apricot (*Prunus Armeniaca*).—Small but good-flavoured apricots are produced at N'gomeni in the Machakos Hills, but although the tree grows vigorously at Nairobi and other highland districts, it is anything but a success from a fruiting point of view.

Banana (*Musa sapientum*)—The banana is found in all places suited to its growth throughout the Protectorate. Many varieties, some of which are of first-rate quality, are grown by the natives. Improved varieties have been obtained from the West Indies, India and elsewhere, and distributed widely in the country.

Citrus.—At various places in the coast littoral, and especially in the Changamwe District some few miles from Mombasa on the Uganda Railway, citrus trees of large size and good bearing properties are fairly common, but in regard to the orange, the fruit is generally of very inferior quality, though here and there exceptions to the rule occur. A form of the Seville orange and a rough variety of lemon are more in evidence than the sweet orange, and in the case of the rough lemon, seeds are being used by local citrus growers for the raising of stocks for receiving buds from imported improved varieties of orange trees established during the last few years in several parts of the Protectorate. Plots of budded orange trees, which include several forms of the Washington Navel and other excellent varieties, are established at the Government Experimental Farm, Kabete, near Nairobi, and at the Experimental Station, Mazeras, in the Coast District.

The bulk of the oranges imported into the Protectorate come from Zanzibar, and is a large, thin-rinded, sweet and juicy variety, but in view of the attention now being given to orange growing, it seems likely that the Protectorate will, in a few years, be in a position to supply its own requirements and possibly have a surplus for export.

Bearing trees raised from seeds of the Zanzibar orange are established at the Government Experimental Station, Mazeras, and as regards growth and the excellence of the fruit are quite satisfactory. This fact is interesting, as showing that seed-raised orange trees may be relied on to breed fairly true, yet where graded fruit is required, budded trees are undoubtedly preferable.

Small groves of choice varieties of orange have been established in the Nairobi District and other parts of the highlands. The trees commence to bear at least a year earlier than at the coast, and large handsome fruit is produced, but they have a somewhat thicker rind and are less sweet and juicy than coast-grown oranges.

Lemons of commercial varieties are also thriving around Nairobi, and samples of the fruit have been favourably reported on in Europe.

Very fine samples of grape fruit (*Citrus decumana*, var.) have also been produced at Nairobi and favourably reported on in England.

Orange, lemon, citron and lime trees are thriving and produce large crops of fruit at the Government Experimental Farm, Kibos, adjoining Lake Victoria Nyanza, and furnish a further illustration of the wide range of country over which citrus fruits can be successfully produced in the East Africa Protectorate.

Cashew Nut (*Anacardium occidentale*).—Common, grows to a large size and fruits abundantly in the coastal districts. The

pear-shaped fruit is borne in clusters, and when quite ripe is juicy and fairly palatable, though decidedly astringent. A single seed or "nut" is borne on the end of the fruit, and when roasted constitutes an article of food, being much liked by natives and residents generally.

Cape Gooseberry (*Physalis peruviana*).—Commonly met with in gardens in the midlands and highlands. The small, yellowish fruits are eaten as dessert and also made into preserve and tarts.

Cherry (*Prunus Cerasus*).—No progress has attended the efforts made to grow cherries in any part of the highlands.

Fig (*Ficus carica*)—Several varieties are grown and generally thrive well in the midlands and most of the settled districts of the uplands.

Gooseberry (*Ribes Grossularia,* var.) and **Currant** (*Ribes rubrum*, var., and *R. nigrum*, var.).—These bush fruits are failures, and the same may be said of garden varieties of the raspberry.

An introduced form of wild raspberry thrives in the uplands and varieties of blackberry are indigenous.

Grape Vine (*Vitis vinifera*).—Muscat of Alexandria, Black Hambro and other grapes have done moderately well in parts of the uplands, but further data are needed in the direction of ascertaining the localities best suited to grape culture and the varieties to be grown. Trials in grape growing are being continued at the Government Experimental Farm, Kabete, as well as by private persons interested in the subject.

Guava (*Psidium Guayava*).—Thrives almost everywhere, but especially well in the coast area and parts of the midlands.

Java Plum (*Eugenia Jambolana*)—This tree is met with here and there in the coast belt and grows to a large size. The fruits resemble damsons, and though astringent are much appreciated.

Loquat (*Eriobotrya japonica*).—Very satisfactory in regard to growth, bearing properties and quality of the fruit, at Nairobi and elsewhere in the uplands.

Mango (*Mangifera indica*).—Huge trees are plentiful in the coast belt and immediate hinterland, and bear heavy crops of fruit. There are several varieties, one of which, known as "Dodo," is considered the best and is of good flavour and practically free of fibre. Mango trees have been introduced to parts of the highlands, including Nairobi, but as yet cannot be considered a success. At Kibos, however, mango trees are growing and fruiting well.

The improvement of the mango is being taken up by the Department of Agriculture, for which purpose grafted plants of select varieties have been obtained from the West Indies for supplying grafts for "inarching" on to stocks of local seed-raised plants.

Mulberry (*Morus*).—A small-fruited variety is commonly grown over a large part of the Protectorate, and bears prolifically. Here and there one or two larger fruited varieties are to be found.

Papaw (*Carica Papaya*).—Does splendidly in the tropical parts and fairly well in the sub-tropical districts. A large variety introduced a few years ago from India is much appreciated and seeds have been widely disseminated.

Passion Fruit, or **Sweet Cup** (*Passiflora edulis*).—This is also popularly known in East Africa as the "Granadilla." It is common in the midlands and highlands and fruits plentifully.

Peach (*Prunus Persica*, var.).—Several varieties from South Africa and India (Saharunpur), thrive well and produce large crops. The fruit is, however, somewhat small and of medium flavour as compared with European-grown peaches.

Nectarines (*Prunus Persica*, var.).—Nectarines are also fairly successfully grown in several highland districts.

Pear (*Pyrus communis*, var.)—Trials have been made with pears in several parts of the highlands, and though in some instances fruit has been obtained the results generally are far from satisfactory.

Pineapple (*Ananas sativus*).—The cultivation of improved varieties of pineapple has been made one of the features of the Government Experimental Farm, Mazeras, with very encouraging success, not only as regards the excellent size and quality of the fruit obtained, but also in the matter of the distribution of pineapple plants in various parts of the Protectorate. Fruits of the smooth Cayenne variety, weighing 10 lbs. and 12 lbs. each, are produced at Mazeras. Pineapples of good size and quality are grown in the suburbs of Nairobi, and attention is given this fruit at the Government Farms at Kabete and Kibos.

A naturalised variety of pineapple is found in a state of semi-cultivation in the coast belt, and under improved treatment at Mazeras and elsewhere the size and quality of the fruit undergoes a very marked improvement.

Pomegranate (*Punica Granatum*).—Widely distributed and very successful from a growth and fruiting point of view.

Plum (*Prunus*).—Does quite well at Machakos, Nairobi and surrounding districts, Limoru, Njoro, etc. The Japanese varieties of *Prunus triflora*, such as Kelsey, Satsuma, &c., are much in favour, though *Prunus communis*, greengage and other European varieties are grown.

Quince (*Cydonia vulgaris*).—Grows and fruits satisfactorily in the uplands.

Sugar Apple (*Anona squamosa*).—Thrives at the coast and in the warmer parts of the country generally.

Sour Sop (*Anona muricata*).—Does well in the hot lowlands and parts of the highlands.

Strawberry (*Fragaria vesca*, var.).—Alpine and garden varieties are grown in several highland localities. The fruit is of good size, but does not, as a rule, ripen thoroughly, and consequently the flavour is somewhat indifferent, judged from the standard of English garden-grown strawberries.

Tree Tomato (*Cyphomandra betacea*)—An unqualified success in most of the settled parts of the highlands and midlands.

List of Fruits grown at M'bali Sana, the property of Mr. Ernest Smith in the Lumbwa District of British East Africa.

This estate is situated in the Nyonda River Valley on the western bank of the river named, and is one of the best stocked fruit orchards of the Protectorate. Unfortunately, the locality is occasionally subjected to hailstorms, otherwise it is an ideal situation for fruit growing, the elevation being about 5,500 to 6,000 feet, and the soil a rich, deep loam.

Mr. Ernest Smith has budded large numbers of orange and other fruit trees at M'bali Sana, and informed the writer that July and August were the best months for carrying out this operation in the Lumbwa District.

A list of the principal fruits in Mr. Smith's orchard and garden is attached.

Apple.—Adam's Incomparable, American Lady, Julien, Blenheim Orange, Scarlet Pearmain, Ben Davis, Wright's Perfection, Rome Beauty, Munro's Favourite, Newton Wonder, Golden Reinette, Jonathan, Cox's Orange Pippin, Delicious, Cleopatra, Springdale, Beauty of Kent.

Plum.—Abundance, America, Hale, Chalco, Satsuma, Kelsey, Combination, Kerr, Mirabella.

Peach.—Early White, Gladstone, General Lee, Florida Crawford, Elberta, Muir, Berenice, Sneed, Dr. Hogg, Pallas; also Saharanpur peaches.

Orange.—Washington Navel, Thompson's Improved Navel, Navelencia, Buckeye Navel, Bahia, Du Roi, Excelsior, Golden Nugget Navel, Jaffa, Dancy Tangerine, Canton, California, Beauty of Glen Retreat, Parker's Special Mandarin.

Loquat.—Japanese Mammoth and others.

Guava.—Mountain, Yellow Chinese.

Raspberry.—Golden Queen, Logan Berries.

Strawberry.—Sensation, Alpine varieties.

Mulberry.—Large Black English and Russian.

Almond (*Prunus Amygdalus*).—Princess and others.

The following miscellaneous fruits are also being grown at M'bali Sana, Lumbwa:—

Quince (Champion), Pomegranate, Papaw, Custard Apple, Pineapple (Smooth Cayenne, Queen and other varieties), Banana (various varieties), Fig.

The following vegetables and salads thrive well at M'bali Sana:—

Bean (Broad Windsor, Dwarf Bean and Haricot varieties), Pea (Stratagem and others), Cabbage, Carrot, Potatoes, Pumpkins, Vegetable Marrow, Parsnip, Tomato, Onion, Leek, Celery, Cho-Cho, or Christophine (*Sechium edule*), Lettuce, and Radish. Rhubarb also thrives well.

LIII.—NOTES ON THE GENERA CORDYLINE, DRACAENA, PLEOMELE, SANSEVIERIA AND TAETSIA.

N. E. Brown.

Whilst preparing a monograph of the genus *Sansevieria* it became evident that the place assigned to it in *Haemodoraceae* by Bentham in *Bentham & Hooker, Genera Plantarum*, vol. iii. p. 679, cannot be sustained, and that its true position is in *Liliaceae*, next to *Dracaena*. Engler, in *Engler & Prantl, Pflanzenfamilien*, vol. ii. pt. 5, p. 84, has already transferred it to *Liliaceae*, though he has not laid stress upon its manifest affinity with the genus *Dracaena*. Apart from the form and fleshiness of its leaves, there is absolutely no technical character by which *Sansevieria* can be separated from *Dracaena* as that genus is at present constituted. There are shrubby and stemless species in both genera, and some species of *Dracaena* have thick coriaceous or sub-fleshy leaves, whilst the inflorescence, articulation of the pedicel, flowers, fruit and seed of *Sansevieria* are in no way different from those of many species of *Dracaena*. After having examined the whole of the Kew material and tabulated all the vegetative and structural characters in an endeavour to discover some definite distinctive character whereby *Sansevieria* might be distinguished from *Dracaena*, the writer is satisfied that although *Sansevieria* may be recognised by its appearance, yet when the details are put into words, there is no single character or combination of characters that will really distinguish all the species of *Sansevieria* from all the species of *Dracaena* as the latter genus is at present constituted. If, however, *Dracaena* be divided into two genera, in accordance with the presence or absence of a distinct tube to the perianth, then definite distinctive characters can be stated. It is, therefore, here proposed to readjust the species of *Dracaena* into two genera characterised by a structural difference in their flowers.

The genus *Dracaena* was founded in 1768 by Vandelli upon the well-known *D. Draco*, Linn., of the Canary Islands, in a very rare work entitled *Dissertatio arbore Draconis*, which is reprinted in Roemer, *Scriptores*, pp. 39–46 and 58, t. 2^a, 2^b. In this plant the perianth is divided into six segments nearly to the base, without any very evident tube, except such as may be formed by the mere overlapping of the margins of the segments. Subsequently other plants have been added to this genus in which the

perianth has a distinct tube, formed by the union of its segments. These latter may be removed from *Dracaena* and placed together in a separate genus, for which we may employ the name *Pleomele* of Salisbury, *Prodromus*, p. 245, published in 1796, as being the most applicable. For although Medikus in 1786 (*Theodora*, p. 83) had already recognised their distinctness from *Dracaena*, yet the name *Terminalis* which he gave to them cannot be accepted; it is too similar to *Terminalia*, long before established by Linnæus, and is, besides, an adjective. With regard to the name *Pleomele*, there is the slight objection that of the two species placed under it by Salisbury, one is a true *Sansevieria*, and the other is (according to the synonymy and locality given) composed of two distinct species. For the *Aletris fragrans*, Linn. (*Dracaena fragrans*, Gawl.) quoted, is a native of West Tropical Africa, whilst Paterson's plant from Van Stadens River in South Africa, also quoted by Salisbury, is undoubtedly *Dracaena Hookeriana*, K. Koch. Both *D. fragrans* and *D. Hookeriana*, however, belong to one genus. If *Pleomele aloifolia*, Salisb., founded upon *Aletris guineensis*, Jacq. (*Hort. Vindobon.*, vol. i. p. 36, t. 84) be removed to the previously established genus *Sansevieria*, where it rightly belongs, because it is a synonym of *S. Jacquinii*, N.E.Br., its removal permits the legitimate use of the name *Pleomele* for *P. fragrans*, Salisb., and the numerous species allied to it. It appears, therefore, better to adopt the name *Pleomele* than to invent a new generic name.

With regard to the generic names *Sansevieria* and *Cordyline* there is much confusion. These names have been in use for more than 50 years for the plants now placed under them, and if the Vienna rule dealing with such cases be upheld there need be no change. But if the law of priority must be enforced then the name *Sansevieria* should give way in favour of *Cordyline*, which antedates it by 31 years.

The statement of the case is as follows:—The name *Cordyline* has been used by three different authors for three distinct genera. The first to give the name appears to have been Royen in 1740 (*Florae Leydensis*, *p.* 22), but as the plants he placed under *Cordyline* are two species of *Yucca* and one *Dracaena*, and his name is, moreover, pre-Linnean, it need not be taken into consideration.

The next to propose the generic use of the name *Cordyline* was Adanson in 1763 (*Fam. des Plantes*, vol. ii. p. 54). This is the first use of the name after the establishment of the Linnean code, and according to the characters given on p. 54, and from the synonymy on p. 543, Adanson's genus is unquestionably identical with *Sansevieria*, Thunb., and is founded upon *S. zeylanica*, Willd. and *S. lanuginosa*, Willd. In the synonymy Adanson quotes *Cordyline*, Royen, as a synonym, but, as above stated, Royen's *Cordyline* was principally founded upon species of *Yucca* and therefore quite at variance with the characters assigned by Adanson.

In 1789, or 26 years later, the name *Cordyline* was proposed by Jussieu (*Gen. Plant.* p. 49) for the plants which are at the present time placed under that generic title.

Jussieu's name of *Cordyline* is, however, antedated by that of *Taetsia*, founded upon *Dracaena ferrea*, Linn. (*Cordyline terminalis*, Kunth), published by Medikus (*Theodora*, p. 82) in 1786.

From the above it is clear that in accordance with priority the names of the two genera in question should stand as follows:—

Cordyline, *Adans.* 1763 (syn. *Sansevieria*, Thunb. 1794).
Taetsia, Medik. 1786 (syn. *Cordyline*, Juss. 1789).

But as at the Vienna Congress of 1905 it was decided to retain the names *Cordyline* and *Sansevieria* for use in the sense they are now employed, it is not here proposed to make any alteration with regard to them. At the same time, however, my personal view of the case would be to abolish the use of the name *Cordyline* altogether, in consequence of the great confusion connected with it, and replace it by that of *Taetsia*.

This change would cause very little inconvenience, as the species of *Cordyline* are not of great economic importance, and under cultivation are mostly known by the name of *Dracaena*.

With regard to the name *Sansevieria*, the case is different. It is a name in common use in gardens and throughout the warmer regions of the world, where various species of this genus are largely scught for on account of the very valuable fibre they yield, and a change of name for garden and commercial purposes would not be adopted.

The distinguishing characteristics of the four genera above mentioned are summarised in the following synopsis. In all of them the pedicels are jointed:—

Ovary with 2–16 ovules in each cell. Trees or shrubs. Leaves stiff or thin and flexible, but not fleshy. Flowers paniculate, usually solitary, rarely 2 or 3 together, very rarely crowded into spikes, each with one bract and 2 bractecles forming an involucre at its base ... ... **Cordyline.**

Ovary with 1 ovule in each cell. Each flower with only 1 bracteole or 1 bract and 1 bracteole at its base, but when the flowers are clustered the bracts and bracteoles are mingled with the pedicels.

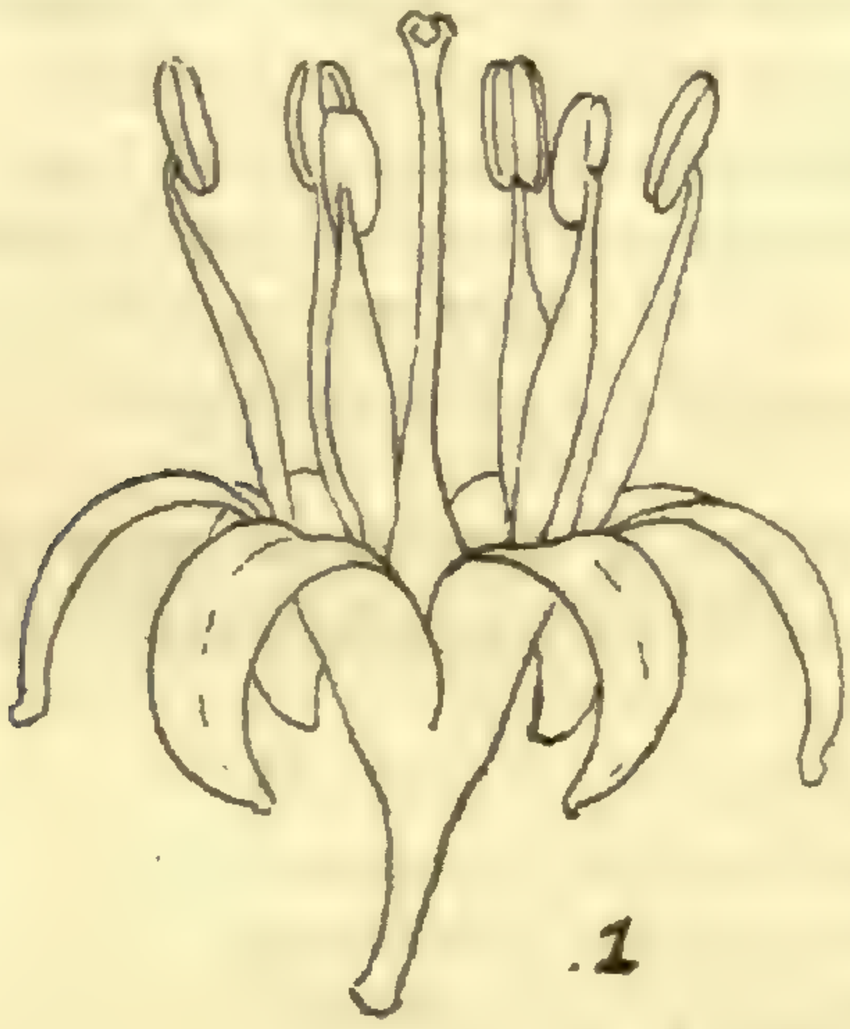
Perianth divided into 6 segments nearly to the base, without an evident tube except such as is formed by the overlapping margins of the segments. Trees or shrubs. Leaves thick and rigid or sub-fleshy, stiffly coriaceous or thin and flexible. Flowers paniculate, arranged in clusters at the nodes of the branches. Filaments of the stamens thickened at the middle ... ... **Dracaena.**

Perianth with the segments united below into a distinct tube at least one-third as long as or sometimes longer than the lobes. Flowers paniculate or in a spike-like raceme along an unbranched axis or in a dense spike or head, solitary or in pairs or clusters. Filaments of the stamens filiform.

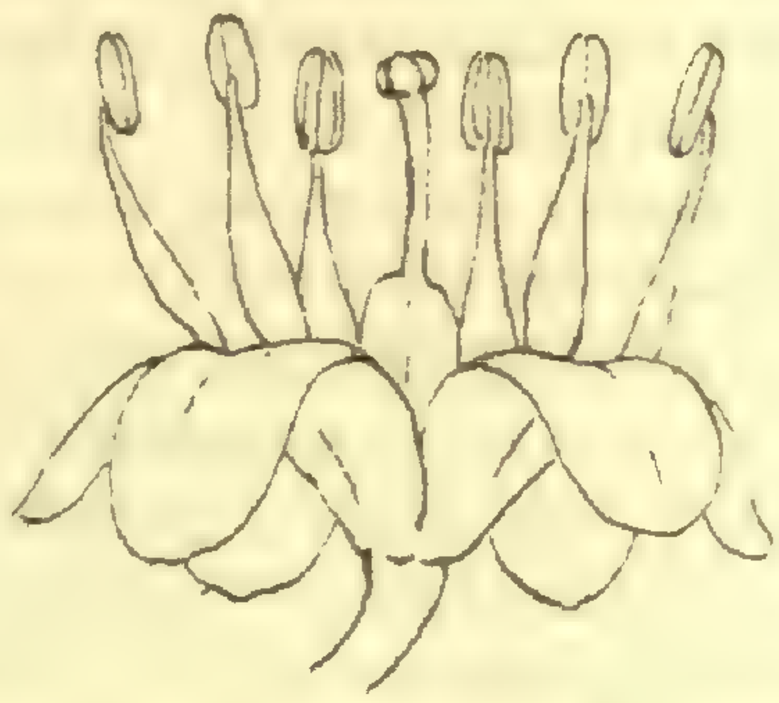
Trees, shrubs or undershrubs with woody or sub-woody stems or stemless plants. Leaves flat, thin or thinly coriaceous, stiff or flexible, usually with an evident and prominent midrib beneath, never fleshy... **Pleomele.**

Shrubs with fleshy fibrous stems or stemless plants, with a thick creeping rootstock. Leaves cylindric, laterally compressed, half-cylindric or flat, fleshy or fleshily coriaceous, rigid, firm or flexible, without or with a very inconspicuous midrib beneath ... ... **Sansevieria.**

To indicate further the difference between the flowers of *Dracaena* and those of *Pleomele*, drawings of two species of each genus are added. The flowers of nearly all the species of *Pleomele* are of the type represented by fig. 4, *P. fragrans* (from a

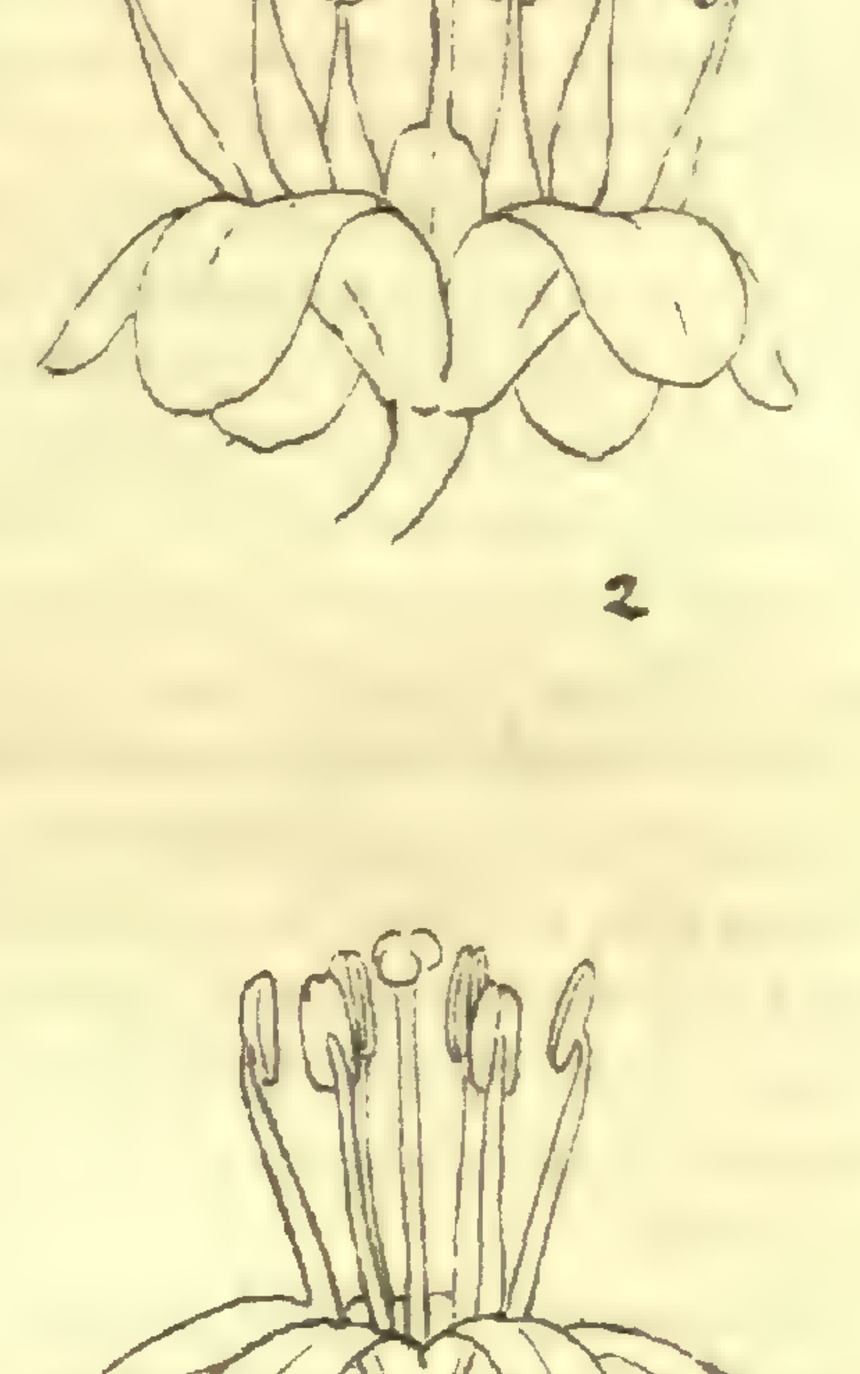


1



2

3



4.

1. *Dracaena Draco*, Linn. × 5.
2. *Dracaena yuccaefolia*, Ridl. × 5.
3. *Pleomele floribunda*, N.E.Br. × 2.
4. *Pleomele fragrans*, Salisb. × 2.

specimen collected by Talbot, No. 1412), whilst that of fig. 3, *P. floribunda*, is quite exceptional, and has relatively the shortest tube of any flower in the genus.

As above characterised, I would refer the species enumerated below to the genera *Dracaena* and *Pleomele* respectively. The list given, however, is not complete, as it only embraces the species of which specimens contained in the Kew Herbarium have been examined. Several others probably belong to the genus *Pleomele* and possibly some to *Dracaena*, whilst others, only known as garden plants, may belong to the genus *Cordyline*. The three species, *Dracaena brachyphylla*, *D. Helferiana*, and *D. pachyphylla*, here placed under *Pleomele*, are all described by Kurz in Journ. Asiat. Soc. Bengal, vol. 42, pp. 248–249, as having the perianth divided "almost to the base." This is clearly a mis-statement. His types are at Kew, and as *D. pachyphylla* has a distinct tube about as long as the lobes and *D. Helferiana* a distinct tube half as long as the lobes, I have very little doubt that *D. brachyphylla* also has a tube, the specimen, however, is without flowers, but has every appearance of belonging to *Pleomele*.

Dracaena, *Vandelli.*

americana, *Donn. Sm.*
Cinnabari, *Balf. f.*
Draco, *Linn.*
Ombet, *Kotschy.*
Saposchnikowii, *Regel.*
schizantha, *Bak.*
serrulata, *Bak.*
yuccaefolia, *Ridl.*

Pleomele, *Salisbury.*

acaulis, *N.E.Br.* (*Dracaena acaulis*, Bak.)
acutissima, *N.E.Br.* (*D. acutissima*, Hua.)
Afzelii, *N.E.Br.* (*D. Afzelii*, Bak.)
angustifolia, *N.E.Br.* (*D. angustifolia*, Roxb.)
arborea, *N.E.Br.* (*D. arborea*, Link.)
atropurpurea, *N.E.Br.* (*D. atropurpurea*, Roxb.)
aurantiaca, *N.E.Br.* (*D. aurantiaca*, Wall.)
aurea, *N.E.Br.* (*D. aurea*, Mann.)
Bakeri, *N.E.Br.* (*D. Bakeri*, S. Ell.)
bicolor, *N.E.Br.* (*D. bicolor*, Hook.)
brachyphylla, *N.E.Br.* (*D. brachyphylla*, Kurz.)
brachystachys, *N.E.Br.* (*D. brachystachys*, Hk.f.)
Braunii, *N.E.Br.* (*D. Braunii*, Engl.)
camerooniana, *N.E.Br.* (*D. camerooniana*, Bak.)
Cantleyi, *N.E.Br.* (*D. Cantleyi*, Bak.)
cerasifera, *N.E.Br.* (*D. cerasifera*, Hua.)
cincta, *N.E.Br.* (*D. cincta*, Bak.)
congesta, *N.E.Br.* (*D. congesta*, Ridl.)
congoensis, *N.E.Br.* (*D. congoensis*, Hua, not *congolensis* as printed in *Index Kewensis*.)
cuspidibracteata, *N.E.Br.* (*D. cuspidibracteata*, Engl.)

cylindrica, *N.E.Br.* (*D. cylindrica*, Hook. f.)
densiflora, *N.E.Br.* (*D. densiflora*, Bak.)
deremensis, *N.E.Br.* (*D. deremensis*, Bak.)
elegans, *N.E.Br.* (*D. elegans*, Hua.)
Elliotii, *N.E.Br.* (*D. Elliotii*, Bak.)
elliptica, *N.E.Br.* (*D. elliptica*, Thunb.)
falsa, *N.E.Br.* (*Sansevieria flexuosa*, Hassk. in *Tijdschr. Natur. Geschied en Phys.* vol. ix. p. 135, not of Blume.)
flexuosa, *N.E.Br.* (*Sansevieria flexuosa*, Blume)
floribunda, *N.E.Br.* (*D. floribunda*, Bak.)
Fontainesiana, *N.E.Br.* (*D. Fontainesiana*, Schult.)
fragrans, *Salisb.* (*D. fragrans*, Gawl.)
fruticosa, *N.E.Br.* (*D. fruticosa*, C. Koch.)
gabonica, *N.E.Br.* (*D. gabonica*, Hua.)
gazensis, *N.E.Br.* (*D. gazensis*, Rendle.)
glomerata, *N.E.Br.* (*D. glomerata, Bak.*)
Godseffiana, *N.E.Br.* (*D. Godseffiana*, Sander.)
Goldieana, *N.E.Br.* (*D. Goldieana*, Bull.)
gracilis, *N.E.Br.* (*D. gracilis, Wall.*)
graminifolia, *N.E.Br.* (*D. graminifolia*, Finl. & Wall. = *D. Finlaysoni*, Bak.)
granulata, *N.E.Br.* (*D. granulata*, Hk. f.)
Griffithii, *N.E.Br.* (*D. Griffithi*, Regel.)
Hanningtonii, *N.E.Br.* (*D. Hanningtoni*, Bak.)
Helferiana, *N.E.Br.* (*D. Helferiana*, Wall.)
Heudelotii, *N.E.Br.* (*D. Perottetii*, var. *minor*, Bak.)
Hookeriana, *N.E.Br.* (*D. Hookeriana*, C. Koch.)
humilis, *N.E.Br.* (*D. humilis*, Bak.)
interrupta, *N.E.Br.* (*D. interrupta*, Bak.)
Kindtiana, *N.E.Br.* (*D. Kindtiana*, De Wild.)
Kirkii, *N.E.Br.* (*D. Kirkii*, Bak.)
Kochiana, *N.E.Br.* (*D. Kochiana*, Regel.)
Lecomtei, *N.E.Br.* (*D. Lecomtei*, Hua.)
linearifolia, *N.E.Br.* (*D. linearifolia*, Ayres.)
Maingayi, *N.E.Br.* (*D. Maingayi*, Hook. f.)
Mannii, *N.E.Br.* (*D. Mannii*, Bak.)
marginata, *N.E.Br.* (*D. marginata*, Lam.)
marmorata, *N.E.Br.* (*D. marmorata*, Bak.)
mayumbensis, *N.E.Br.* (*D. mayumbensis*, Hua.)
Melleri, *N.E.Br.* (*reflexa*, var. *salicifolia*, Bak., not *D. salicifolia*, Regel.)
monostachya, *N.E.Br.* (*D. monostachya*, Bak.)
nitens, *N.E.Br.* (*D. nitens*, Welw.)
nutans, *N.E.Br.* (*D. nutans*, Ridl.)
pachyphylla, *N.E.Br.* (*D. pachyphylla*, Kurz.)
Papahu, *N.E.Br.* (*D. Papahu*, Engl.)
parviflora, *N.E.Br.* (*D. parviflora*, Bak.)
Perottetii, *N.E.Br.* (*D. Perottetii*, Bak.)
petiolata, *N.E.Br.* (*D. petiolata*, Hook. f.)
phanerophlebia, *N.E.Br.* (*D. phanerophlebia*, Bak.)
phrynioides, *N.E.Br.* (*D. phrynioides*, Hook.)
Poggei, *N.E.Br.* (*D. Poggei*, Engl.)

Porteri, *N.E.Br.* (*D. Porteri*, Bak.)
Porteana, *N.E.Br.* *Folia* sessilia, 50–60 cm. longa, 15–17 cm. lata, linearia, attenuato-acuminata, costa subtus insigniter prominente. *Flores* ignoti.

This is the plant referred by Baker in Journ. Linn. Soc. vol. 14, p. 540, to *Cordyline terminalis*, Kunth, but it bears no resemblance to the broad oblong-lanceolate petiolate leaves of that plant and is evidently closely allied to *Pleomele cincta*, but is well distinguished by its longer leaves and the remarkably prominent midrib. Flowers are unknown, but I have little doubt that it is a true *Pleomele*.

prolata, *N.E.Br.* (*D. prolata*, Wright.)
reflexa, *N.E.Br.* (*D. reflexa*, Lam.)
robusta, *N.E.Br.* (*D. robusta*, Ridley.)
salicifolia, *N.E.Br.* (*D. salicifolia*, Regel, not *D. reflexa*, var. *salicifolia*, Bak.)
Sanderiana, *N.E.Br.* (*D. Sanderiana*, Sander.)
siamica, *N.E.Br.* (*D. siamica*, Ridl.)
silvatica, *N.E.Br.* (*D. silvatica*, Hua.)
Smithii, *N.E.Br.* (*D. Smithii*, Bak.)
Soyauxiana, *N.E.Br.* (*D. Soyauxiana*, Bak.)
spicata, *N.E.Br.* (*D. spicata*, Roxb.)
Steudneri, *N.E.Br.* (*D. Steudneri*, Engl.)
surculosa, *N.E.Br.* (*D. surculosa*, Lindl.)
Talbotii, *N.E.Br.* (*D. Talbotii*, Rendle.)
thalioides, *N.E.Br.* (*D. thalioides*, Makoy.)
Tholloniana, *N.E.Br.* (*D. Tholloniana*, Hua.)
Thwaitesii, *N.E.Br.* (*D. Thwaitesii*, Regel.)
timorensis, *N.E.Br.* (*D. timorensis*, Kunth.)
ugandensis, *N.E.Br.* (*D. ugandensis*, Bak.)
umbraculifera, *N.E.Br.* (*D. umbraculifera*, Jacq.)
usambarensis, *N.E.Br.* (*D. usambarensis*, Engl.)
viridiflora, *N.E.Br.* (*D. viridiflora*, Engl.)
xiphophylla, *N.E.Br.* (*D. xiphophylla*, Bak.)

LIV.—CONTRIBUTIONS TO THE FLORA OF SIAM.

ADDITAMENTA VII.

Lepisanthes siamensis, *Radlk.* [Sapindaceae-Lepisantheae]; ante fructum notum dubitanter generi *Sapindo* adscripta (*Sapindus? siamensis*, Radlk.), nunc fructu obvio, cum *Lepisanthe mekongensi*, Pierre, *Lepisanthis* sectionem constituit, sectionibus Eulepisanthes, Scorododendron et Anomosanthes (cf. Radlk. in Sap. Holl.-Ind., 1877, p. 104 (34) sqq. et in Engler et Prantl Nat. Pflanzenfam., iii. 5 (1895) p. 320) sub nomine Anomorrhiza adjungendam, insignem embryonis radicula punctiformi ad

seminis latus ventrale (nec dorsale ut e.g. in *L. tetraphylla*, Radlk., cf. fig. 165 in Engler et Prantl, l.c.) paulo infra medium sita (cf. Pierre, Fl. For. Cochinch., t. 326A, fig. 13), verbis sequentibus circumscribendam :—

Sectio IV. **Anomorrhiza,** Radlk. *Discus* unilateralis, semilunaris, (glaber). *Petala* 4, squamis cristatis aucta. *Cotyledones* oblique superpositae; radicula punctiformis, infra hilum ventralis (cf. Radlk. in Engl. u. Pr. Nat. Pflanzenf., Nachtr. iii. Lief. 3, p. 203).

Character speciei ut loco infra citato, addenda fructus descriptione :—

Fructus indehiscens, trilocularis, trigono-globosus, trisulcato-lobatus, 5 cm. diametro, hirtello-tomentosus, intus glaber, pericarpio carnoso cellulis magnis crebris gummi-resina quadam (nec in alcohol nec in aqua, sat facile viro, etsi incomplete, in alcohol aquoso solubili) foetis persito sicco indurato crustaceo rubro-fusco 1–1·5 mm. crasso, endocarpio collenchymatico. *Semen* ellipticum, a lateribus compressiusculum, 4 cm. longum, 1 cm. latum, 2 cm. crassum, pilis brevibus aureo-splendentibus (sat amplis pachydermiosis) perlaxe adspersum, testa crassiuscula coriaceo-crustacea fusca, hilo longitudinali notata, intus pallidiore laevi reticulato-venosa; embryo carnosus, quodammodo curvatus; cotyledones crassae, oblique superpositae, superiore majore (plano commissurali a micropyle supra basin ventrali fere ad tertiam seminis dorsi partem superiorem adscendente), granulis amyli compositis (in fragmenta 5–9 partitis) farctae; radicula infra hilum ventralis, punctiformis.—*Sapindus? siamensis*, Radlk. in Kew Bull. 1912 p. 265 et apud Craib, Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57 p. 45.

Prê, 156–260 m., *Luang Vanpruk* 119, 191; Prê, Mê Chwa, 150 m., *Luang Vanpruk*; Lakawn, in savannah, 240 m., *Kerr* 2563.

Delpya muricata, *Pierre emend. Radlk.* in Lecomte Not. Syst. i. p. 304 [Sapindaceae—Cupanieae, uti nunc fructu maturo cognito patet in qua tribu ob calycis et disci unilateralis indolem juxta genus *Diploglottis* collocanda videtur].

Fructus descriptio l.c. secundum fructum vix semimaturum a Pierre lectum elaborata, nunc secundum fructum maturum a Kerr nuperrime lectum emendanda est ut sequitur.

Fructus capsularis, *Aesculi* fructum aemulans, processibus ad 2 cm. longis echinatus, his exclusis 4 cm. diametiens, 3-locularis, 3-valvis, axe nullo relicto; valvae dorso sulco longitudinali exaratae, intus septiferae, 4–6 mm. crassae, corticosae, radiatim dense fibrosae, siccae induratae, toto dorso in processus crebros subulato-filiformes rigidos apice flexibiles rubiginoso-pilosos glandulisque resini ornatos productae et inter hos tomento rufo glandulisque indutae, intus materia gummoso-resinoso illitae. *Semina* in loculis solitaria (partim abortiva), erecta, obovoidea, 18 mm. longa, ad 12 mm. lata et crassa, strato gummoso-resinoso (arillo? vel testae parte carnosa?) obducta, intus plica testae a basi adscendente in loculamenta 2 incomplete partita (uti *Schleicherae*

semina), loculamento inferiore ampliore, testa modice crassa subossea, parte inferiore reticulato-venosa solubili embryoni arcte adhaerente, hilo prope basin laterali; embryo curvatus, notorrhizus, cotyledonibus crasse carnosis oleo et aleuro foetis inter se arcte cohaerentibus parte dimidia inferiore (cum radicula) loculamentum seminis amplius inferius explentibus ceterum inaequalibus, dorsali parum curvata, ventrali-apice hamato curvata et in loculamentum superius inflexa, radicula minuta breviter conica.

Mê Ping Rapis, Ok Ma, 130 m., *Kerr* 2187; Hue Paka, 150 m., *Kerr* 2955; Lampun, 360 m., *Kerr* 2552; Bangkok, *Zimmermann* 123; Prê, 18 m., *Luang Vanpruk* 276,452; Petchabouri (ex. *Fl. Indo-Chine*).

Genus ob fructum capsularem, uti nunc patet, in Sapindacearum subserie "Eusapindaceae anomophyllae" Cupaneis adsociendum, in qua tribu ob calycis et disci unilateratis indolem juxta genus "Diploglottis" collocandum videtur. Ceterum disco in marginem cyathiformem elevato et pericarpio echinato crasso radiatim fibroso *Paranephelium* in mentem revocat.

Kalanchoe Craibii, *Raymond Hamet* [Crassulaceae]; *K. laciniatae,* DC., *K. macrosepalae,* Hance et *K. gracili,* Hance, affinis, sed sepalorum forma valde distincta.

Caulis erectus, robustiusculus, simplex, glaber, sed apice pilosus. *Folia* opposita; lamina a basi trisecta; petiolus lamina brevior, graciliusculus, basi dilatatus. *Inflorescentia* caulis non distincta, corymbiformis, in cymis subsimplicibus. *Pedicelli* corollae tubo breviores. *Calyx* subcampanulatus, pilosus, segmentis tubo 1·2 mm. longo longioribus late lineari-sublanceolatis acuto-acuminatis 8·6 mm. longis 2·6–2·75 mm. latis. *Corolla* subtubulosa, in dimidium inferiorem dilatata et basi coarctata, segmentis tubo 10·6 mm. longo paulo brevioribus obovato-suborbicularibus abrupte subcuspidatis 10·6 mm. longis, 7·1 mm. latis. *Stamina* supra corollae tubi medium inserta; antherae superiores, corollae segmentorum basem subattingentes. *Carpella* conniventia, ovato-lanceolata, in stylos conniventes 2·3 mm. longos quam carpella 9·5 mm. longa, 3·6 mm. lata breviores attenuata. *Squamae* lineares, acutiusculae, 3·5 mm. longae, 0·2 mm. latae.

Lampun, dry scrub jungle, 300 m., *Kerr* 2823.

Kalanchoe Dixoniana, *Raymond Hamet* [Crassulaceae]; *K. grandiflorae,* Wight et Arn., affinis sed distinctissima.

Caulis erectus, robustiusculus, simplex, glaber. *Folia* opposita, glabra, petiolo lato 2·3 cm. longo a lamina vix distincto suffulta; lamina obovata, obtusa, 11 cm. longa, 3·2 cm. lata, marginibus leviter crenatis. *Inflorescentia* caulis non distincta, corymbiformis, cymis pauciramosis; pedicelli corollae tubo breviores. *Calyx* pilosus, subcampanulatus, tubo 1·3 mm. longo, segmentis subdeltoideis actuo-subacuminatis 5·5 mm. longis 2·5 mm. latis. *Corolla* subtubulosa, in dimidium inferius dilatata et basi coarctata, tubo 12 mm. longo, segmentis ovato-lanceolatis sensim subcuspidatis 7·5 mm. longis 3·25 mm. latis. *Stamina* supra corollae tubi medium inserta; antherae superiores corollae segmentorum basem paulo superantes. *Carpella* conniventia, ovata-lanceolata, in stylos conniventes 2·3 mm. longos attentuata, 8 mm.

longa, 2·5 mm. lata. *Squamae* lineares, valde emarginatae, 2·6 mm. longae, 0·6 mm. latae.

Doi Chieng Dao, on rocks 1650-1770 m., *Kerr* 2876. Cult. Hort. Trin. Coll., Dublin.

Lagerstroemia Collinsae, *Craib* [Lythraceae-Lythreae]; *L. calyculatae*, Kurz et *L. Balansae*, Koehne, affinis, sed foliis minoribus facile distinguenda.

Ramuli primo stellato-pubescentes, cito glabri, cortice cinereo-brunneo obtecti. *Folia* lanceolata, oblongo-lanceolata vel ovato-lanceolata, apice acuminata, summo apice obtusa, basi cuneata vel rotundato-cuneata, usque ad 7·5 cm. longa et 3·5 cm. lata, mox subcoriacea, juventute pagina utraque stellato-pubescentia, cito omnino glabra, nervis lateralibus utrinque 8–9 intra marginem anastomosantibus supra conspicuis leviter immersis subtus prominentibus, nervis transversis reticulationem subgracilem in foliis maturis formantibus, petiolo circiter 4 mm. longo supra late haud altius canaliculato mox glabro suffulta. *Bracteae* angustae, alabastra ochraceo-tomentosa subaequantes. *Calycis* infructescentis tubus 8 mm. longus; lobi 6, deltoidei, acuti, usque ad 6 mm. longus et 4·5 mm. latus, intra superne cinereo-tomentosi. *Petala* oblongo-obovata, apice rotundata, 2 cm. (ungue 4 mm. longo incluso) longa, circiter 9 mm. lata. *Fructus* pedicello 2·5 mm. longo ut calyce pilis arboreo-ramosis ochraceo-tomentoso suffultus, 12 mm. altus, 10 mm. diametro, fuscus, apice cinereo-tomentosus.

Sriracha, edge of bank above beach, 4·5 m., *Mrs. D. J. Collins* 38, 190.

Siamese name (of timber), Kra bek.

Beaumontia Murtonii, *Craib* [Apocynaceae-Echitideae]; a *B. brevituba*, Oliver, cui affinis, sepalis angustioribus facile distinguenda.

Frutex volubilis; ramuli primo densius ferrugineo-furfuracei, mox glabri, cortice cinereo sparse lenticellato obtecti. *Folia* oblonga vel oblongo-oblanceolata, apice breviter obtuse acuminata, basi cuneata, usque ad 20 cm. longa et 8·5 cm. lata, subcoriacea, supra primo puberula, mox glabra, subtus pallidiora, sparsius molliter breviter pubescentia, nervis lateralibus utrinque circiter 16 rectis intra marginem anastomosantibus pagina superiore parum impressis inferiore prominentibus, nervis transversis inter se subparallelibus satis remotis subtus prominulis supra parum impressis, petiolo validiusculo circiter 1 cm. longo suffulta. *Panicula* terminalis, ad 13 cm. longa, floribus albis (ex *Kerr*); bracteae deciduae, circiter 1·5 cm. longae; pedicelli sub anthesin circiter 4 cm. longi, ut ramuli ferruginei. *Sepala* lanceolato-oblonga, acute acuminata, vix 4 cm. longa, 1·4 cm. lata, utrinque sed inferne mediumque versus puberula, lateribus plus minusve oblique plicatis. *Corolla* alba (ex Kerr); tubi pars basalis cylindrica vix 2 cm. longa, extra densius tomentella, pars expansa circiter 5 cm. longa; lobi circiter 4 cm. longi et lati, intus apicem versus et extra puberuli. *Filamenta* 3·5 cm. longa, glabra, antheris in toto 1·3 cm. longis. *Ovarium* depressum,

disco subaequialtum, dense ferrugineo-tomentellum; stylus inferne pilis brevibus hic illic instructus.—*Beaumontia* sp. n., Craib in Kew Bull. 1911 p. 415 et Contrib. Fl. Siam in Aberd. Univ. Studies No. 57 p. 131.

Kow Hoo Wen, *Murton* 113. Sriracha, Nawng Yai Bu, 15 m., in old clearing, *Kerr* 2676.

Premna Collinsae, *Craib* [Verbenaceae-Viticeae]; a *P. striata*, Craib, floribus minoribus recedit.

Ramuli puberuli, mox straminei, striati, pauci-lenticellati, ad 3 mm. diametro. *Folia* oblonga, ovato-oblonga vel elliptica, basi cuneata vel acuminata, apice acuminata, mucronata vel acuta, rarius obtusiuscula, 5–11·5 cm. longa, 2·5–7·2 cm. lata, chartacea vel membranaceo-chartacea, pagina superiore costa nervisque marginemque versus sparse puberula, inferiore costa nervisque puberula, nervis lateralibus utrinque 4–5 intra marginem anastomosantibus supra conspicuis vel saepe parum impressis subtus prominentibus, nervis transversis pagina utraque conspicuis, margine integra; petioli foliorum oppositorum inaequales, 1–5 cm. longi, puberuli, supra canaliculati. *Cymae* in corymbos et ramulos et ramulos breves laterales terminantes ad 5 cm. longas et 8 cm. diametro dispositae, partibus omnibus densius adpresse breviter pallide pubescentibus; bracteae inferiores ad 3 mm. longae; ramuli inferiores oppositi, ad 3 cm. longi; pedicelli calyce breviores. *Calyx* circiter 2 mm. longus, subaequaliter 5-lobatus, lobis usque ad 0·75 mm. longis. *Corolla* extra superne parce puberula, intra dense pilosa, tubo vix 2 mm. longo lobis 4 subaequilongo. *Stamina* exserta. *Stylus* stamina paulo superans.

Sriracha, 3 m., *Mrs. D. J. Collins* 109.

Premna dubia, *Craib* [Verbenaceae-Viticeae]; *P. micranthae*, Schauer, habitu similis sed calyce majore, foliis supra costa nervisque puberulis vel fere glabris differt.

Frutex ramulis puberulis mox teretibus cortice stramineo striato pauci-lenticellato obtectis. *Folia* forma variabilia, saepissime oblonga vel elliptica, apice plerumque acuminata, acuta vel obtusa, rarius retusa, basi cuneata vel rotundata, integra, 5·5–12·5 cm. longa, 3·5–7·5 cm. lata, chartacea, supra in costa nervisque sparse puberula vel fere glabra, subtus in costa nervisque puberula, nervis lateralibus utrinque 5–6 rectis satis obliquis intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis subtus prominulis; petioli foliorum oppositorum inter se haud aequales, usque ad 3·2 cm. longi, puberuli, supra canaliculati. *Corymbi* ramulos breves laterales terminantes, circiter 5 cm. longi et 8 cm. diametro, densius puberuli; bracteae infimae at 4 mm. longae; pedicelli calyce parum breviores vel ei subaequilongi. *Calyx* 1·75 mm. longus, bilabiatus, lobis duobus majoribus late deltoideis obtusisusculis vix 0·5 mm. longis, ceteris minutis. *Corolla* extra superne puberula, intra dense albo-pilosa, tubo 1·75 mm. longo, lobis 4 oblongis apice rotundatis tubo longioribus. *Stamina* 4, exserta. *Pistillum* glabrum, stylo staminibus subaequialto.

Lakawn, common in scrub jungle, 225 m., *Kerr* 2562.

Clerodendron Lloydianum, *Craib* [Verbenaceae-Viticeae]; a *C. Godefroyi*, O. Kuntze, foliis majoribus facile distinguendum.

Frutex, ramulis pallide viridibus densius albo-pubescentibus. *Folia* oblongo-oblanceolata vel oblanceolata, apice acuminata, acutiuscula, basi cuneata vel cuneato-rotundata, 15–30 cm. longa, 5–8·5 cm. lata, chartaceo-membranacea, supra pilis albis transverse septatis longiusculis tenuiter instructa, infra pallidiora, molliter pubescentia, ciliata, remote denticulata integrave, nervis lateralibus utrinque 8–10 pagina superiore conspicuis inferiore prominulis, nervis transversis paucis infra vix prominulis, petiolo 2·7–4·5 cm. longo ut ramulis pubescente suffulta. *Calyx* utrinque pubescens, tubo 1·5 mm. longo, lobis lanceolatis superne attenuatis acutis 5·5 mm. longis circiter 2 mm. latis. *Corollae* tubus vix 1·5 cm. longus, superne extra puberulus; lobi anguste obovati, inferne attenuati, 8 mm. longi, 4·5 mm. lati, extra puberuli. *Stamina* exserta, filamentis glabris, antheris 2·5 mm. longis basi sagittatis. *Stylus* staminibus subaequialtus; ovarium 1 mm. altum. *Fructus* 1 cm. altus, calyce in fructu 2·5 cm. diametro.

Prê, 180 m., *Phra Vanpruk* 499.

Sauropus Garrettii, *Craib* [Euphorbiaceae - Phyllantheae]; foliorum forma texturaque distinguendus.

Ramuli graciles, primo quadrangulares, mox teretes, angulati, glabri. *Folia* ovata, ovato-lanceolata vel rarius oblonga, apice acuminata, rarius haud distincte acuminata, obtusiuscula, mucronulata, basi rotundata vel fere truncata, apices versus ramulorum magnitudine gradatim crescentia, 1·8–7·3 cm. longa, 1·4–3·2 cm. lata, chartacea vel rigide chartacea, glabra, sicco supra brunnescentia, subtus pallide viridia, nervis lateralibus utrinque 4–5 intra marginem anastomosantibus pagina utraque subconspicuis, nervis transversis paucis subobscuris, margine anguste recurva, petiolo vix 2 mm. longo suffulta; stipulae lanceolatae, acutae, 2·5 mm. longae. *Flores* viridi-lutei (ex *Garrett*). *Fl.* ♂ 6 mm. diametro, ramulis abbreviatis axillaribus parvi-bracteatis gesti; pedicelli graciles, circiter 1 cm. longi; lobi breves, rotundati. *Fl.* ♀ 9 mm. diametro, axillares, solitarii, pedicellis ad 1 cm, longis quam iis florum masculorum validioribus suffulti; segmenta 3·5 mm. longa, 2·5 mm. lata. *Fructus* paulo ultra 1 cm. diametro, pericarpio tenui stramineo.

Doi Intanon, N. by E. of the Pah Ngeam, 1155 m., *Garrett* 37.

Sauropus orbicularis, *Craib* [Euphorbiaceae-Phyllantheae]; a speciebus adhuc descriptis foliis ellipticis vel rotundatis membranaceo-chartaceis recedit.

Caules annui, ad 60 cm. longi, e radice perenni orti (ex *Kerr*), primo quadrangulares, mox teretes, glabri, cortice viridi obtecti. *Folia* elliptica, ovato-elliptica vel rotundata, apice rotundata mucronulata, basi rotundata vel truncato-rotundata, 1·8–3·5 cm. longa, 1·7–3·1 cm. lata, membranaceo-chartacea, pagina utraque glabra, nervis lateralibus utrinque 6–8 plerumque rectis bene intra marginem anastomosantibus cum costa supra conspicuis subtus prominentibus, nervulis supra conspicuis subtus prominulis, margine saepius parum recurvo, petiolo circiter 2 mm.

longo suffulta; stipulae circiter 1·25 mm. longae; *Fl.* ♂ 2·5 mm. diametro, pedicello gracili 3 mm. longo praeditus. *Fl.* ♀ ad 4·5 mm. diametro; pedicelli vix 2 mm. longi, basi parvi-bracteati. *Calycis* segmenta ad 1·75 mm. longa et lata, inferne attenuata. *Ovarium* apice truncatum, stylis tribus bifidis ad ovarii marginem positis.

Chiengmai, Dio Sutep, mixed jungle, 660 m., *Kerr* 2635.

Chorizandra orientalis, *Craib* [Euphorbiaceae-Phyllantheae]; a *C. pinnata,* Wight, inter alia foliis puberulis distinguenda.

Suffrutex, ramulis gracilibus primo angulatis puberulis mox teretibus glabris corticeque brunneo vel fusco-brunneo obtectis. *Folia* obovata vel elliptico-obovata, apice rotundata vel saepius parum retusa, basi cuneata, ad 1·3 cm. longa et fere 1 cm. lata, chartacea vel fere rigide chartacea, pagina utraque sparse breviter puberula, nervis lateralibus utrinque 4–5 sub oculo armato pagina utraque conspicuis, nervis transversis paucis subtus sub lente fere conspicuis, margine recurvo, petiolo 1 mm. plerumque vix attingente suffulta; stipulae parvae. *Flores* masculi circiter 1 mm. diametro, staminibus liberis perianthium fere duplo superantibus. *Capsula* depresso-globosa, 1 mm. alta, 2·5 mm. diametro; semina parva brunnea.

Mê Ping Rapids, Keng Ap Nang, abundant on limestone rocks, 180 m., *Kerr* 2946.

LV.—THE VARIETIES OF OIL-PALM IN WEST AFRICA.

(*Elaeis guineensis*, Jacq.)

Some particulars of the varieties of this palm were given in the *Kew Bulletin*, 1909, pp. 33-49, chiefly compiled from reports received from our Colonies in West Africa. The specimens of the palms submitted to Kew in connection with these reports were subsequently sent to Prof. O. Beccari, of Florence, for critical examination and he has recently published his results in an extensive paper, "Contributo alla Conoscenza della Palma a Olio," which appeared in L'Agricoltura Coloniale (Firenze) vol. viii. 1914, pp. 5-37; 108-118; 201-212; 255-270: Reprint (1914) pp. 1-76, tt. i.-xviii., to which issue the pages quoted below refer. The following statement merely correlates as far as possible the native names mentioned in the *Kew Bulletin* referred to with the varieties established by Prof. Beccari, and the names given by him to the specimens of fruits in the Museum at Kew, are included.

Perhaps the most striking of the varieties are the "King Palm" (var. *idolatrica*, Chev.) with its undivided leaves, a photograph of which has recently been sent to Kew by Mr. J. H. J. Farquhar, of the Forestry Department, Southern Provinces, Nigeria—the "white oil-palm nut" (var. *albescens*, Becc.), known so far only from the Gold Coast, the "soft-shelled nut" (var. *communis*, Chev. forma *tenera*, Becc.) and the "soft nut" or "shell-less" (var. *gracilinux*, Chev.).

Elaeis guineensis, *Jacq.* Select. Stirp. Amer. (1763) p. 280; Fl. Trop. Afr. viii. (1902) p. 125.

var. **albescens,** *Becc.* Contrib. alla Conosc. della Palma a Olio (L'Agric. Col. viii. 1914), p. 62.
Abe-fita or Abe-fufu (Gold Coast) *Kew Bull.* 1909, pp. 39, 40, 45, 49, ff. 16, 17; Abe-fita. Becc. l.c. t. 16, f. 5; Abefita (Abefufu) Gold Coast Colony (Imp. Inst.), Mus. Kew, 1909; Abe Fufu, Gold Coast (A. E. Evans), Mus. Kew, 1908; White Oil Palm, *Kew Bull.* l.c. pp. 41, 45.

var. **angulosa,** *Becc.* l.c. p. 49.
Okpörö Eyop (Eifik, Old Calabar), *Kew Bull.* l.c. pp. 37, 48, f. 7; Okoro Oyop, Becc. l.c. t. 14, f. 4; Okporokpo (Ibo), *Kew Bull.* l.c. p. 37; Ikrök Eyop (Ibibio) l.c. p. 37; Okpörö Eyop (Old Calabar), Okporokpo, Ikrok Eyop, Becc. l.c. p. 26; Okporo Oyop, Old Calabar (H. N. Thompson), Mus. Kew, 1908.

var. **Ceredia,** *Chev.* Les. Veget. Utiles L'Afriq. Trop. Franc, vii. (1910) p. 56; Becc. l.c. p. 42, t. 9.
Adi-be (Gold Coast), *Kew Bull.* l.c. pp. 39, 40, 41, 45; Becc. l.c. p. 64, t. 16, f. 1; Osök Eyop, (Eifik, Old Calabar), *Kew Bull.* l.c. pp. 37, 48, f. 6; Osök Oyop, Becc. l.c. pp. 25, 48, 49, t. 14, f. 2; Osuku (Ibo), *Kew Bull.* l.c. p. 37; Becc. l.c. p. 25; Adésran, *Kew Bull.* l.c. p. 42; Eduege Eyop (Ibibio), *Kew Bull.* l.c. p. 37, Becc. l.c. p. 25; Adibe, Aburi, Gold Coast (W. S. D. Tudhope) Mus. Kew, 1910; Osok Oyop, Old Calabar (H. N. Thompson), Mus. Kew, 1908; Abedam-adibe, Aburi, Gold Coast (W. S. D. Tudhope), Mus. Kew, 1910.

var. **communis,** *Cher.* l.c. p. 47; Becc. l.c. p. 42; sub sp. *nigrescens*, var. *communis*, Chev. l.c.
Udin (Benin), *Kew Bull.* l.c. pp. 36, 37; Becc. l.c. p. 25; Ope-Pamkora (Yoruba), *Kew Bull.* l.c. pp. 36, 37; Ok-poruk-pu (Ibo) *Kew Bull.* l.c. pp. 36, 37; Becc. l.c. p. 26; Okporukpu, Akponojub, Ope Pamkora, Udin (var. *communis*), Becc. l.c. p. 26; Akponojub (Eifik, Old Calabar), *Kew Bull.* l.c. p. 38.

var. **communis,** *Cher.* forma **dura,** *Becc.* l.c. pp. 37, 52; var. *macrosperma*, Welw. Apont. p. 584; *Kew Bull.* l.c. pp. 43, 46; Becc. l.c. p. 76; var. *communis dura*, del Congo Belga, Becc. l.c. t. 15, f. 4; Abe-pa (Gold Coast), *Kew Bull.* l.c. pp. 38, 39, 40, 45, 49, f. 15; Becc. l.c. p. 52, t. 15, f. 1; Afia Okpö Eyop (Old Calabar), *Kew Bull.* l.c. pp. 37, 49, ff. 8, 9, 10; Efia Ekpo Oyop, Becc. l.c. pp. 26, 49, 50, t. 14, f. 3; Ojina (Ibo) l.c. pp. 26, 37, 45; Efiako Eyop (Ibibio) l.c. pp. 26, 37, 45; Ak-por-ro-jub (Eifik, Ibibio), *Kew. Bull.* l.c. p. 37; Becc. l.c. p. 25; Dé (djédjé) (Dahomey), *Kew Bull.* l.c. p. 42; Dé Ede or Deti

(Togoland), *Kew Bull.* l.c. pp. 43, 45; De, Becc. l.c. t. 6, f. A; Dihohô (Angola), *Kew Bull.* l.c. pp. 43, 45, 46; Abe Pa, Gold Coast (W. S. D. Tudhope), Mus. Kew, 1908; Gold Coast (A. E. Evans), Mus. Kew, 1909; Efia Ekpo Oyop, Old Calabar (H. N. Thompson), Mus. Kew, 1908; Hard Shell Palm Nut, *Kew Bull.* l.c. p. 37; Becc. l.c. p. 25.

var. **communis,** *Cher.* f. **fatua,** *Becc.* l.c. p. 54.
Abe-dam (Gold Coast), *Kew Bull.* l.c. pp. 39, 40, 45; Becc. l.c. p. 54, t. 16, f. 4; Botanic Gardens, Aburi (W. S. D. Tudhope), Mus. Kew, 1909.

var. **communis,** *Cher.* f. **leucocarpa,** *Becc.* l.c. pp. 40, 75.
nigrescens communis (vulgaris), Chev. l.c. p. 5; Lolequel (Dabou, Ivory Coast), Becc. l.c. t. 7, f. B; ?Af-fiako-jub (Ibo), *Kew Bull.* l.c. pp. 36, 38, 45; ?Becc. l.c. p. 25; ?Ojuku (Eifik), *Kew Bull.* l.c. pp. 38, 45; ?Af-fiako-jub.=Ojuku (v. ?) Becc. l.c. p. 26.

var. **communis,** *Cher.* f. **semidura,** *Becc.* l.c. pp. 51, 56.
Abe-tuntum (Gold Coast), *Kew Bull.* l.c. pp. 38, 39, 40, 45, 46, 49, f. 14; Becc. l.c. p. 56, t. 15, f. 3; Gold Coast (A. E. Evans), Mus. Kew, 1908; Gold Coast (W. S. D. Tudhope), Mus. Kew, 1909.

var. **communis,** *Cher.* f. **tenera,** *Becc.* l.c. pp. 38, 51; *E. nigrescens*, var. *communis*, Chev. l.c.; *E. guineensis*, Jacq, var. *microsperma*, Welw. Fl. Trop. Afr. viii. (1902) p. 125; *Kew Bull.* l.c. pp. 44, 46; Abobo-be Gold Coast), *Kew Bull.* l.c. pp. 34, 38, 39, 40, 41, 46, ff. 1, 2, 3; Becc. l.c. pp. 51, 58, t. 15, f. 2; Yue Wyiam (Gold Coast), *Kew Bull.* l.c. p. 34; Dégbakou (Dahomey), l.c. pp. 42, 46; Degbakoum (var. *communis tenera*), Becc. l.c. t. 6, f. B.; Disombé or Disombo (Angola). *Kew Bull.* l.c. pp. 43, 44, 46, 49, ff. 4, 5; Dé-débakui, Dechla (Togoland), *Kew Bull.* l.c. pp. 43, 46; Lisombe, Isombe (Cameroons), *Kew Bull.* l.c. pp. 39, 44, 46; Ausuku (Ibo), *Kew Bull.* l.c. p. 37; Becc. l.c. p. 26; A-soge-e-jub (Eifik), *Kew Bull.* l.c. pp. 37, 38; Becc. l.c. p. 26; Ope-arunfo (Yoruba), *Kew Bull.* l.c. pp. 34, 35, 36, 46; Becc. l.c. p. 26; Iviorommila (Benin), *Kew Bull.* l.c. pp. 36, 46; Abobo-be, Botanic Gardens, Gold Coast, Mus. Kew, 1909; Soft-shelled-nut, *Kew Bull.* l.c. pp. 34, 38, 39; Thin-shelled variety, l.c. p. 46.

var. **gracilinux,** *Cher.* l.c. p. 64; Becc. l.c. p. 47; *E. virescens*, Chev. var. *gracilinux*, Chev. l.c.; Digumbé (Angola), *Kew Bull.* l.c. p. 43; Votchi (Dahomey) l.c. p. 42; var. (*virescens*) *gracilinux*, Chev. n.v. Sédé-Votchi, Becc. l.c. t. 12, f. B; Soft Nut, Gold Coast, Mus. Kew; Shell-less (soft nut), Gold Coast, Becc. lc. pp. 52, 67, t. 14, f. 6.

var. **idolatrica,** *Chev.* l.c. p. 57; Becc. l.c. p. 43; var. (*nigrescens*) *idolatrica,* Chev. n.v. Fadé, t. 12, f. A; *E. Dybowski*, Hua, Bull. du Mus. i. (1895); *E. Thompsonii*, Chev. in Govt. Gaz. S. Nigeria, July 14, 1909, Suppl. p. 25; *E. guineensis*, var. *Thompsonii*, in "The Oil Palm and its Varieties," Farquhar (1912) p. 4; Abe Ohene (Gold Coast), *Kew Bull.* l.c. pp. 36, 39, 40; Becc. l.c. pp. 51, 68, and t. 14, f. 5; Fadé, Agoudé (Dahomey), *Kew. Bull.* l.c. p. 42; Agadé, Agodé, Klude (Togoland), l.c. pp. 43, 46; Ogedudin, Ogiedi (Benin), l.c. pp. 36, 45, 49, f. 11; Becc. l.c. p. 25; Ope-Ifa (Yoruba), *Kew Bull.* l.c. pp. 35, 36, 38, 46, 49, f. 11; Abe-Ohene (Gold Coast), Mus. Kew; King Palm, *Kew Bull.* l.c. pp. 41, 42, 45; Palmier fetiche (Dahomey), l.c. pp. 41, 42; Sacred Palm (Togoland), l.c. p. 43.

var. **intermedia,** *Chev.* l.c. p. 63; Becc. l.c. p. 47; var. (*virescens*) *intermedia,* Chev. n.v. Sédé di Ouidah, Becc. l.c. t. 11, f. A.

var. **macrocarpa,** *Cher.* l.c. p. 54; Becc. l.c. p. 41, t. 8, f. B; *E. nigrescens*, var. *macrocarpa*, Chev. l.c.

var. **macrocarya,** *Becc.* l.c. p. 71 (sub. sp.), t. 13, f. B; No. 303 (Barter) Niger Expedition, Mus. Kew, 1859.

var. **macrophylla,** *Cher.* l.c. p. 59; Becc. l.c. p. 44; *E. nigrescens*, var. *macrophylla*, Chev. l.c. p. 66; Abubube (Gold Coast), *Kew Bull.* l.c. pp. 39, 40, 41, 45; Becc. l.c. t. 16, f. 3; Abu Be, Becc. l.c. p. 60; Abubube, Gold Coast (W. S. D. Tudhope), Mus. Kew, 1909.

var. **pisifera,** *Cher.* l.c. p. 55; Becc. l.c. p. 41, t. 8, f. A ("Votchi"); t. 7, f. A (var. *communis tenera* passante alla *pisifera*).

var. **repanda,** *Cher.* l.c. p. 61; Becc. l.c. p. 45, t. 10, f. A (var. *repanda* Chev., di Niaouli, n.v. Sédé o Kissédé), t. B (var. *repanda*, Chev., di Adjonaja, n.v. Sédé); Abedam and Abobo-Be (Gold Coast), Becc. l.c. p. 66, t. 16, f. 6 (Abedam Cross, var. *virescens*?); Kessédé, *Kew Bull.* l.c. p. 45; Becc. l.c. p. 14; Kissédé, Sédé (Dahomey), *Kew Bull.* l.c. p. 42; ?Dihûsué (Angola), *Kew Bull.* l.c. pp. 43, 45; Abedam, Botanic Gardens, Aburi, Gold Coast, said by the natives to be a cross between Abedam and Abobobe (W. S. D. Tudhope), Mus. Kew, 1909; a variety with green tinted fruits, *Kew Bull.* l.c. p. 42.

var. **rostrata,** *Becc.* l.c. p. 50, t. 15, f. 5 (v. *rostrata*?); Mbana Eyop (Old Calabar), *Kew Bull.* l.c. pp. 37, 38, 48, ff. 12, 13; Mbana Oyop, Becc. l.c. pp. 26, 50, t. 14, f. 1; Ekuebuba (Ibo), *Kew Bull.* l.c. p. 37; Becc. l.c. p. 26; Ayarambana Eyop (Ibibio), *Kew. Bull.* l.c. p. 37, Becc. l.c. p. 26; Mbana Oyop, Old Calabar (H. N. Thompson) Mus. Kew, 1908.

J. H. H.

LVI.—THE MEXICAN HAWTHORN.

(*Crataegus pubescens*, H.B.K.).

O. STAPF.

Among the few species of *Crataegus* which inhabit the Mexican tableland one has been familiar to the people of the country for a very long time, mainly on account of its fruits which were and are still made into various kinds of preserves. Hernandez,* who from 1571 to 1577 explored Mexico, records it under the name Texocotl or Pomum saxeum (rock apple), a name which is still in use among the Mexicans, its Spanish form being Tejocote or Texocote. He says of it: "It is a medium-sized tree, with leaves like those of our apple tree, but rougher and serrate. It grows wild in the mountains, and it bristles with spines. It bears apples like our apples, but they are smaller, not larger than walnuts, yellow, quite hard before they are mature, but almost as soft as grease when ripe. Their taste is, at least to my palate, unpleasant, but many appreciate it. The seeds, which occur in triplets in each apple, are as hard as stones, half-moon shaped, rather large for the size of the apple, two angled with a conspicuous ridge on the back. They are cooked with sugar and honey in many ways, and thus become mild and not less pleasant to eat than our apples. The Mexican Indians sell them in their markets after they have let them go rotten and thereby deprived them of their raw taste. If they wish to preserve them longer in a fresh state, they sprinkle them with soda and water. The crushed stones infused with water are said to cure skin-rashes and to lower the temperature of the body, particularly if mixed with 'capolin.'"†

D. Vic. Cervantes, who was professor of botany in the City of Mexico from 1788–1829, also refers to "Tejocote" in his "Ensayo à la Materia Medica vegetal de Mexico,"‡ naming it "*Mespilus mexicana*." He says of it that it grows on all the mountains of Mexico and that the fruits and seeds are astringent and corroborant. Sessé and Mociño, who explored large districts of Mexico between 1795 and 1804, likewise knew it and described it in their "Plantae Novae Hispaniae"‖ as "*Crataegus Crus galli*," or "Texocotl" of the Mexicans. Their description refers undoubtedly to the "Texocotl," whilst the references to Kalm and Miller and the statement that it also occurs in Virginia, are due to mistakes of identification. They say of it that it inhabits cool and temperate localities mainly in the neighbourhood of Mexico, and that its "berries" are sweetish-sour, edible, and used mostly for sweet preserves, as they produce an abundance of jelly which, prepared with sugar, is much relished by the Indians. It was from a drawing§ of this plant, which Sessé and Mociño had prepared, that De Candolle¶ described his *Crataegus mexicana* in 1825, placing it among the "Species haud satis notae." How-

* F. Hernandez, Opera (ed. 1790), vol. ii. p. 508.

† *Prunus capuli*, Cav.

‡ Published in El Estudio, 1889 (see p. 25).

‖ Published as an Appendix of La Naturaleza, ser. ii., vol. i. (1887–1890) and again independently in 1893.

§ De Candolle, Calques Dessins.

¶ De Candolle, Prodromus, vol. ii. p. 629.

ever, by the time the description appeared, he had been forestalled by Humboldt and Bonplaud, who had come across the plant near the mines of Moran (now in the State of Hidalgo), at an altitude of 2600 m., in February, 1804. A very full description and an excellent plate were published by them in their "Nova Genera et Species"* under the name of *Mespilus pubescens*. They knew it only in the flowering state and gave no information as to its uses. Of the more recent Mexican literature on the subject two publications may be quoted, namely, "Datos para la Materia Médica Mexicana" (1900), by Jos. Ramirez, and "Manual Terapeutico de Plantas Mexicanas" (1909) by Leop. Flores. Ramirez's account is so much vitiated by his confusion of the Mexican tree with the North American *C. Crus-galli* and *C. berberifolia*, of which he copies figures from Sargent's "Silva of North America," that little can be gleaned from it that is new or reliable; but he, too, describes the tree as common in the valley of Mexico, and we may also accept his statement that decoctions of the root are used in Mexico as an aperitive and diuretic and of the fruit as a useful pectoral. He devotes several pages to the chemistry of the root, but it is not worth while to enter into this subject here. He further states that the wood of Tejocote is used in Mexico in cabinet-making, and the stems to graft apples and pears on, since these thus become more resistant. His statement that the tree has been in cultivation for a long time may be taken to apply to the Mexican hawthorn or to *C. Crus-galli*. Flores, however, is more decided on this point, saying that "Texocotl" has "there" (that is, in Mexico) been in cultivation for a long time. Otherwise his account is merely a condensed repetition of Ramirez's observations. The plant represented by Humboldt and Bonpland's figure and Mociño and Sessé's drawing is characterised by a somewhat compact habit, due to the shortness of the leaf-bearing branches and by the more or less lanceolate (3–5·5 cm. by 1·2–2 cm.) and serrate to dentate leaves, covered beneath with a fairly conspicuous tomentum. The stipules are deciduous at an early stage, and the corymbs are rather few-flowered with thin, narrow bracts. The following specimens in the Kew Herbarium may be considered to correspond to this form:—

1. Graham, nos. 193 and 194, collected "Mexico," 1830; no. 193 bears spines; no. 194 is spineless and has the following note attached: "Cultivated. Like the wild, but no thorns, and the fruit a little larger."

2. J. Gregg, no. 618*c*, collected "Mexico," 1848–1849. Exactly like Graham's unarmed specimen.

3. Bourgeau, no. 50, collected at Santa Fé, in the Valley of Mexico. An unarmed fruiting specimen with gnarled branches.

4. H. Christie, received 1871, collected "Mexico."

5. C. C. Parry and Ed. Palmer, no. 228, collected in the region of San Luis Potosi, 1878. A fruiting specimen like Bourgeau's.

6. C. G. Pringle, no. 11,440, collected in open woodlands near Eslaba, Federal District, 17, ix, 1903. A fruiting branch exactly like the preceding, and a flowering branch, evidently collected at

* Humboldt, Bonpland and Kunth, Nova Genera et Species Plantarum, vol. vi. p. 213, t. 555.

a different time and probably from a different plant. It has more distant larger leaves and foliaceous stipules.

It is doubtful whether this form has ever been in cultivation in Europe, or if so, it must have lost its characteristic features and passed into the condition which was early known to gardeners as *Crataegus stipulacea* and *Crataegus mexicana*, and is even now, as it seems, the only form represented in gardens. This plant possesses more or less elongated branches, and consequently a more open habit and larger leaves (up to 8 cm. by 3·5 cm.), which incline towards an oblanceolate or obovate shape with a tendency towards lobing, being at the same time less hairy than in Humboldt and Bonpland's form. The stipules and bracts are generally more developed, frequently foliaceous and more persistent, and the corymbs contain on the average more flowers. The first reference to it is in Loddiges' Catalogue for 1826 (p. 40), where the name *Crataegus stipulacea* is given without any further information. In 1835 it was figured as *C. mexicana* by D. Don in Sweet's British Flower Garden (2nd series) at t. 300. The plate represents a spineless plant—it is described as an unarmed bush—with fairly large leaves, foliaceous falcate stipules, and yellowish fruits as large as those of a medlar. It is stated in the text to have been introduced from seed received by Mr. Lambert in 1829, and to have flowered first in his garden at Boyton House, Wilts, in 1834. There was at the time some controversy* as to the correctness of the date of introduction; but Lambert† stated that the fruits were brought to this country, with other seeds including those of *Arbutus xalapensis*, and given to him by the "late Lord Napier" on his return from Mexico. This was William John, 8th Lord Napier, who died in 1834. It is probable that Lord Napier returned from Mexico in 1824 as the introduction of the *Arbutus* is generally accepted as having taken place in that year.

Several specimens must have been in existence in gardens in England as early as 1835.‡ From one of them, no doubt the one in the Horticultural Society's Garden, a plate was published by Lindley in the Botanical Register, t. 1910, in 1836. It evidently represents the same form as the one shown on t. 300 of Sweet's Flower Garden, although it bears a short barren branchlet which in the shape and size of the leaves, and their more congested arrangement, recalls the habit of the form depicted in Humboldt and Bonpland's, and in Mociño and Sessé's figures. By that time it had also found its way into France, for Spach,‖ in 1834, quotes the name of "*Mespilus stipulacea*, Desf. Hort. Par.," which points to the early existence of the plant in the famous Paris garden. He couples with it as a synonym "*Crataegus stipulacea*, Loddig. Cat.," but uses the new name, "*Mespilus Loddigesiana*." His clear description leaves no doubt that he had the plant before him that was then grown in English gardens as *Crataegus stipulacea* or *C. mexicana*. He also describes the great range of variation in

* Loudon, Gardener's Magazine, vol. xi. (1835), 473, 474.

† In Loudon, Gardener's Magazine, l.c. p. 583.

‡ See Loudon, Gardener's Magazine, xi. 474, and Loudon. Arboretum et Fruticetum Brittanicum, ii. 843.

‖ Spach, Hist. Nat. Veg. ii. 54.

the shape of the leaves, and points out that those of the "terminal" shoots are often pinnatifid or trifid with large cultriform persistent stipules.

Subsequently the Mexican hawthorn seems to have received little attention from the horticulturist. It continued, however, in cultivation, and probably some of the trees of the first introduction are still in existence. K. Koch,* who in his "Dendrologie" devotes nearly three pages to the discussion of it under the names of *Mespilus mexicana* and *M. pubescens*, observes that he saw it in England as well as in France, adding that it is cultivated in Mexico, and has become very variable in the shape of leaves and as regards tomentum and fruit characters. He thought that D. Don's figure in Sweet's British Flower Garden represented the cultivated form, and that of the Botanical Register the wild. As we know it is practically certain that Don's and Lindley's plant came from the same source. He also mentions Loddiges' *C. stipulacea* as a third form distinguished by larger, slightly lobed leaves, and more or less persistent stipules, the latter, however, a character which he did not find constant in the specimens which he saw himself. He further says that he also found *Mespilus pubescens*, H. B. K., in cultivation in France; but his description of it, and the fact that he refers to it *C. subserrata* of Bentham, are not compatible with this determination. Up to the early sixties there is no evidence that any Mexican hawthorns were in cultivation in Europe except those of Lambert's (Lord Napier's) introduction; but about that time, according to K. Koch,† the tree was reintroduced in what appeared to be the wild state. No further reference, however, to this second introduction has been found. The plant remained a rarity in gardens to which little attention was paid.

The following specimens taken from trees cultivated in Europe are at Kew:—

1. London Horticultural Society's Garden, 1838 (Herb. Benth.) sub *Crataegus mexicana*. Has long shoots with lobed leaves and large foliaceous stipules.

2. Chelsea Physic Garden. Three sheets (*a*) fruiting, leaves coarsely dentate to sublobed, sub *C. Crus-galli*, coll. Nov. 1899; (β) fruiting, leaves as shown in Bot. Reg. t. 1910, one long shoot with coarsely dentate or sublobed leaves, and large stipules, as in London Arboretum et Fruticetum, ii. 867, fig. 617, sub *Crataegus stipulacea*, coll. Sept. 1900; (γ) flowering, exactly like Bot. Reg. 1910, sub *Crataegus stipulacea*, coll. June, 1904.

3. Paris, Botanic Garden; fruiting, leaves as in the Chelsea specimen (γ), but more lanceolate; long-shoot with stipules and leaves as in Chelsea specimen (β); barren short shoot with small lanceolate leaves as in Bot. Reg. t. 1910 (the lower branchlet on the left side), very like Humboldt and Bonpland's figure, but very sparingly hairy, all these collected 1899 and grown as *C. stipulacea*, Steud.

4. Kew, specimen received from Paris, 1891, no. 123, (*a*) barren

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* K. Koch, Dendrologie, i. 132–134 (1869).

† K. Koch in Wochenschr. f. Gärtnerei u. Pflanzentkunde, vol. v. p. 363 and Dendrologie, p. 132.

long-shoot with coarsely dentate or (the uppermost) sub-lobed glabrescent leaves and foliaceous stipules; (β) flowering shoot with large coarsely dentate glabrescent leaves, coll. 1901; (γ) flowering and fruiting, leaves less coarsely dentate to dentate-serrate, with the teeth often small, glabrescent underneath, stipules narrow, linear, early deciduous, all from the same tree, sub *C. mexicana*, coll. 1913. The examination of this tree in the autumn of 1914 showed that the lobing of leaves and the presence of distinctly foliaceous stipules were confined to long-shoots growing up perpendicularly from the branches. All the other foliage was fairly uniform, except in size, and corresponded with the type represented in Sweet's Flower Garden, approaching also very closely to that shown in the Botanical Register, t. 1910.

5. Hort. Segrez, a flowering branch with very coarsely dentate to sublobed, almost glabrescent leaves and narrow foliaceous stipules, leaf-bases markedly cuneate, grown as *Crataegus spathulata*,* coll. May, 1885.

6. Hort. Ellacombe at Bitton; two flowering branches, the nearest approach to the type represented by Humboldt and Bonpland's figure and practically indistinguishable from it except for its more scanty tomentum; a long-shoot with coarsely dentate leaves and foliaceous stipules, just like the long-shoot in the Paris specimen; grown as *Crataegus mexicana*, coll. June, 1890.

None of these specimens possess spines; but there are spines of the ordinary type here and there on the Kew tree, mostly at the base of the long-shoots.

The form originally described by Humboldt and Bonpland, the area of which, as far as it can be ascertained from the material at Kew, is confined to the Mexican tableland from S. Luis Potosi to the Federal District of Mexico, I shall call f. *Humboldtii*. The question arises now, what evidence is there that the form cultivated in Europe—we may call it conveniently f. *stipulacea*—occurs in Mexico? There are, to begin with, two specimens at Kew, collected in Mexico, which may be considered good representatives of it. One is the flowering branch already mentioned as issued with a small leaved fruiting branch under C. G. Pringle's no. 11,440 and collected in open woodlands near Eslaba (2660 m.) in the Federal District; the other a flowering specimen, C. G. Pringle, 6547, from the base of the Sierra of Ajusco (2600 m.), also in the Federal District, both having been distributed as *Crataegus stipulosa*, Steud. The only difference that might be pointed out as existing between them and the *C. stipulacea* of gardens is in the slightly denser tomentum of the leaves. It will be observed that both specimens come from the very area of the f. *Humboldtii*, but there is no indication of their having been taken from cultivated trees.† In less complete agreement with that form are the following specimens arranged geographically:—

Hidalgo. 1. C. G. Pringle, no. 6631, river banks near Tula

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* The true *C. spathulata* is *C. cuneata* Sieb. et Zucc., of Japan.

† Eggleston, speaking of *Crataegus* in Mexico generally, says "the trees are guarded as carefully as other fruit trees are with us" (Bull. Torr. Bot. Club, xxxvi, p. 504), and there is no evidence that they are actually cultivated on anything like a large scale.

(2300 m.). (2) A barren branch with long spines and leaves varying from obovate-cuneate to elliptic-oblong, and, on the short-shoots, to lanceolate-oblong, dentate-crenate or serrate, fairly hairy below and provided with narrow foliaceous stipules; branches with very similar foliage occur occasionally on the Kew tree: (3) a fruiting branch with small leaves, mostly elliptic oblong and often quite obtuse, 2–4·5 cm. by 1·2–2·2 cm., or even smaller; the leaves resemble those of the barren branch of the Paris specimen described above, but they are more obtuse.

2. Coulter, no. 84, Real del Monte. This locality is situated very close to Moran, the locus classicus of *C. pubescens*. The leaves are elliptic to elliptic-oblong, obtuse, very minutely crenate-dentate and accompanied by broad foliaceous stipules. The specimen is in flower. Similar leaves occur very rarely in the cultivated f. *stipulacea*.

Puebla. 3. Liebmann, Guinantla (2100 m.). A fruiting branch, intermediate between Coulter, no. 84, and f. *Humboldtii*.

Vera Cruz. 4. Galeotti, Jalapa. A flowering branch; leaves lanceolate-oblong, subacute, distinctly and unequally crenate in the upper part, 4–5 cm. long, 1·5–1·8 cm. wide, glabrescent.

5. Linden, no. 656, April, 1838, la Hoya los Vigas. A small flowering branch, very like Galeotti's.

6. C. G. Pringle, no. 8081, thickets about Jalapa (1300 m.), March, 1899. Two flowering branches and a young long-shoot with obtusely three-lobed leaves. The corymbs terminate either short-shoots with very narrow early deciduous stipules or long-shoots with foliaceous and more persistent stipules. The range of variation in the shape of the leaves of the flowering pieces is very great, being from obovate to elliptic and lanceolate. The leaves are mostly obtuse, their crenation or denticulation is distinct, with traces of lobing, and their tomentum is scanty. They measure 3–5 cm. by 1·5–4 cm. and their texture is rather thin.

7. Botteri, no. 831, Febr. 1854, Orizaba. A fruiting branch; leaves elliptic-oblong to oblong, obtuse, crenate, rather tomentose beneath, up to 4 cm. by almost 3 cm.

Morelos. 8. C. G. Pringle, no. 6983, fields about Tepoxtlan (2250 m.); a large tree. Flowering branch with mostly broad-oblong and obtuse or acute leaves with small crenae and foliaceous cultriform stipules, blades 4–8 cm. by 2·5–4 cm. Barren armed branch with smaller, more acute and, lower down, narrower almost oblanceolate leaves. Similar foliage occurs in the Kew tree, except that the crenation is rarely so minute.

We thus find that the Mexican hawthorn of European gardens occurs in a practically identical condition within the natural area of *Crataegus pubescens* (Mespilus pubescens, *H.B.K.*), while forms more or less like it extend beyond it on to the outer slopes of the Mexican table-land. But we have at present no means of working out the genetic relations that exist between this f. *stipulacea* and the original *C. pubescens*, that is, the f. *Humboldtii* on the one hand and the modifications which are covered by some of the specimens mentioned above (1–8). There occurs no doubt a good deal of variation in the same individual, probably mainly due to conditions of nutrition and insolation, and it may be assumed that the

same factors would assert themselves in the development of the pure-bred progeny, producing individuals differing perhaps as much as those that have just been described. To define these limits of fluctuation it would be necessary to experiment and to observe in the field. Meanwhile the taxonomist will have to be satisfied with describing and disposing the forms in such a manner that they can be recognised and named with a fair degree of certainty. His task will, in the circumstances, be of an essentially practical, and at the same time preliminary, nature. To treat all the modifications he can distinguish in his collections as independent units would be as little justified as to neglect them altogether on the assumption that they are the expression of an inherent instability.

All we can assert at present with respect to the Mexican Hawthorn amounts to this:—There is a tree in cultivation, known as the Mexican Hawthorn, and designated variously *Crataegus stipulacea* and *C. mexicana*. It is, in spite of a certain instability of some characters, mainly connected with the foliage, a fairly homogeneous and easily recognisable unit. It has its counterpart in the wild state in Mexico. It is associated there with a number of slight modifications which cannot, from the very limited material at our disposal, be readily and reliably distinguished from it, but at the same time also with a form which is sufficiently differentiated to be recognised by the combination of its characters as something different. This form has been described and figured as *Mespilus pubescens*.

The differences mainly affect vegetative characters which are known to be individually unstable, and may be assumed to be subject to the influence of external factors. Nothing is known from the standpoint of heredity and hybridisation as to the behaviour of the plants under consideration, and consequently as to their genetic relations. Taxonomically this condition would seem to find its rational expression in this way.

Crataegus pubescens (as species) {
- f. *Humboldtii*, occasionally verging towards f. *stipulacea*.
- f. *stipulacea*, including slightly aberrant modifications of f. *stipulacea*.

The first attempt to classify the species of *Crataegus* subsequent to De Candolle, was K. Koch's.* Among the forms dealt with in his article he distinguished the following species: (1) *C. Loddigesiana* (Mespilus stipulacea *Desf.*, M. Loddigesianus, *Spach*); (2) *C. mexicana;* (3) *C. hypolasia* (C. Lambertiana, *Hort.*, C. mexicana *D. Don, Sweet's Brit. Fl. Gard, haud aliorum*); (4), *C. pubescens* (Mespilus pubescens, *H. B. K.*); (5) *C. stipulacea* (C. stipulosa, *Steud.*, Mespilus stipulosa, *H. B. K.*); (6) *C. quitensis* Benth. In the Appendix to his paper (p. 299) his *C. hypolasia* is reduced to *C. mexicana*, to which he also refers *C. subcrenata*, Benth., a name not previously mentioned by him. I shall have to refer to *C. stipulosa*, *C. quitensis*, and *C. subcrenata* later on. As Koch had not seen any specimens of the species mentioned except

* K. Koch in Verh. Verein. Beförd. d. Gartenbau N. Ser. i. (1853) pp. 221–312.

one collected by Mociño and Sessé, and one of *C. subcrenata*, his classification as outlined above may be passed over. Nine years later* he made another attempt, uniting *Mespilus*† *Loddigesiana* and his own *Crataegus hypolasia* with *M. mexicana* (the latter a new combination based on *C. mexicana*, DC.), and Bentham's *Crataegus subserrata* with *M. pubescens*, which like *M. stipulosa* and *M. quitensis* (a new combination for *Crataegus quitensis*) he retained as distinct species. The same classification is employed in his "Dendrologie" (1869), with the exception of the disappearance of *M. quitensis*.

Why *M. pubescens* should be distinct from *M. mexicana* is not clear from his description, which moreover hardly fits Humboldt and Bonpland's plant, and was apparently drawn up from a "*stipulacea*" plant which he saw in France.

The first to recognise the identity of Humboldt and Bonpland's and Mociño and Sesse's plant was E. Regel‡ in 1871, but he also extended the conception of species so as to include *C. subserrata* and *C. quitensis*, and made no attempt to distinguish forms within it. Dippel‖ adopted the same view with the exclusion of *C. quitensis*. More recently Eggleston§ published a paper on "The Crataegi of Mexico and Central America," which is mainly based on the study of an ample American material. Unfortunately only a small portion of the specimens quoted by him are represented at Kew. He distinguishes (1) *C. pubescens* (Mespilus pubescens, *H. B. K.*). This is certainly not Humboldt and Bonpland's plant, and corresponds more or less to my f. *stipulacea*. (2) *C. pubescens*, Botteri. This again is evidently one of the "modifications" of f. *stipulacea*, if the Kew specimen of Botteri, no. 831, from Orizaba, can be depended upon as being identical with Botteri, 1121, quoted by Eggleston. (3) *C. mexicana* (including Lindley's and D. Don's plants, figured under that name, and *C. subserrata*, Benth). This includes representatives of both f. *Humboldtii* and f. *stipulacea*. (4) *C. mexicana microsperma*. The original of this in habit and foliage very much resembles Parry and Palmer, no. 228, which Eggleston enumerates under *C. mexicana*, and I have referred to f. *Humboldtii*; but it consists only of a fruiting branch, and the apparently quite mature fruits are much smaller than those of *C. mexicana*. The area from which Eggleston records it includes the states of Jalisco, Michoacan, Guerrero, and Oaxaca. It is also known as "Tejocote," and "a jelly is made from the fruit, resembling that from the quince." Eggleston adds, "this may prove a good species."

I have referred above to *Crataegus subserrata*, Benth., and *Mespilus stipulosa*, H. B. K. (Crataegus stipulosa, *Steud.*) as supposed synonyms of the Mexican Hawthorn. *Crataegus subserrata* was described from specimens collected by Hartweg in

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* K. Koch in Wochenschrift f. Gärtnerei u. Pflanzenkunde, vol. v. (1862).

† He extended in this place *Mespilus* so as to include *Crataegus* in it as a subgenus.

‡ E. Regel in Act. Hort. Petrop. vol. i. p. 107.

‖ Dippel, Handb. d. Laubholzkunde, vol. ii. 426.

§ W. W. Eggleston in Bull. Torr. Bot. Club, vol. xxxvi, pp. 501–514.

Guanajuato (no. 47), in 1836. Eggleston, who saw a specimen of it in the Gray Herbarium, says that it, "seems to represent a rather entire-leaved form of *C. mexicana* which . . .is not worthy of even a varietal name." In my opinion, it is one of those slight "modifications" which I have, in the absence of better evidence, treated under f. *stipulacea*. The case of *Mespilus stipulosa*, is somewhat different. It was described from specimens collected by Humboldt and Bonpland in the valley of Chillo, near Quito, in 1802. About thirty years later it was collected again in the very same locality by Col. Hall. There are two sheets of his collecting at Kew, representing the plant in flower, and named *Mespilus stipulosa*. They are labelled:—a "Mespilus, found in the valley of Chillo, near Alangasi, elevation 8400 feet. Fruit pyriform, yellowish-green. A small tree." "*C. mespilus*—The valley of Chillo, about 8000 ft., corolla white, fruit pyriform, green." Ten years later it was once more collected there, this time by Hartweg, in 1842, the collector noting that it was "a shrub or small tree, 10–20 feet high. In the 'quebrada' (ravine) de San Marcos á Guito; in the valley of Chillo near Puembo." This specimen consists of a branch with several gnarled branchlets, one of which bears a ripe fruit, whilst another has a two-flowered inflorescence. It formed the material from which Bentham* described his *Crataegus quitensis*. There can be no doubt in my opinion that it is identical with Humboldt and Bonpland's *Mespilus stipulosa* (Crataegus stipulosa, *Steud.*). Eggleston identified with it a number of specimens from Guatemala and, with some reserve, from the neighbouring State of Chiapas. The corresponding Kew material (J. D. Smith, 2531, from Sacatepéquez, Guatemala; Skinner, coll. 1857, Guatemala; Ghiesbreght, 630, Chiapas) fully bears out his determination. It is difficult to distinguish from *C. pubescens*, as understood here, the principal difference is seen in the more pubescent upper surface of the leaves and their slightly more numerous (7-8 instead of 4-7) nerves, which are more densely whitish-hairy below, and therefore more conspicuous. The leaves vary a great deal in size and shape, but they are very rarely lanceolate, and show no tendency to lobing. All the fruits with the Kew specimens, whether from Ecuador or Central America, have persistent calyces, not deciduous, as Eggleston says. However, I see no reason why, in the present state of our knowledge, *C. stipulosa* should be reduced to *C. pubescens*, the more so as it inhabits a definite area apart from that of *C. pubescens*. The synonymy of *Crataegus pubescens* is therefore as follows:—

Crataegus pubescens.

f. *Humboldtii.*

1824 Mespilus pubescens, *H. B. K.*
1825 Crataegus mexicana, *DC.*
1909 C. pubescens, *Eggl.* p.p.
1909 C. mexicana, *Eggl.* p.p.

f. *stipulacea.*

1826 Crataegus stipulacea, *Lodd.*
1834 Mespilus stipulacea, *Desf.*
1834 M. Loddigesiana, *Spach.*
1835 Crataegus mexicana, *D. Don.*
1843 C. subserrata, *Benth.*
1853 C. hypolasia, *K. Koch*
1862 Mespilus mexicana, *K. Koch*
1909 Crataegus pubescens, *Eggl.* p.p.
1909 C. pubescens var. Botteri, *Eggl.*
1909 C. mexicana, *Eggl.* p.p.

* Bentham, Plantae Hartwegianae, p. 173 (1843).

Before concluding these remarks I have to refer to certain species proposed by Sessé and Mociño. It has already been pointed out that they referred the "Texocotl" of the Mexicans to *Crataegus Crus-galli* in their "Plantae Novae Hispaniae" (p. 78); but they describe in the same place three more species of *Crataegus*, two of which, to judge from the descriptions, are very probably mere forms of *C. pubescens*. They are: (1) *C. indica*, an unarmed plant with lanceolate leaves, serrulate from the middle upwards and villous below, and with subulate bracts, collected at S. Rosa, near Guanojuato; (2) *C. inermis*, also unarmed, with elliptic entire leaves, tomentose below, and with subulate purplish bracts, collected near "Michaelopolitanum." The third, *C. minor*, characterised by very small setaceously-mucronate leaves and small flowers, is evidently quite distinct. The same descriptions appear in the author's "Flora Mexicana" (ed. ii., p. 125), which was published in 1894. Of *C. inermis* a figure (t. 349) is said to exist in their collection of drawings at Madrid. An inspection of that plate and of the specimens, if such exist, will in the future solve the question of their identity: but this much seems to be certain; they cannot well belong to any other of the Mexican species enumerated by Eggleston.

LVII.—MISCELLANEOUS NOTES.

Mr. Chamberlain and Kew.—The Right Honourable Mr. Austen Chamberlain writes to the Director:—

"Thank you very much for sending me the *Kew Bulletin* with Sir W. Thiselton-Dyer's memorial notice of my father's connection with the Gardens.

"I do not know whether you are aware of the full story of the completion of the Temperate House to which he alludes. One afternoon in the House of Commons Sir William Harcourt, then Chancellor of the Exchequer, asked my father to pair with him for dinner. My father replied that he was afraid he could not do that as he was intending to speak on the motion which was then before the House.

"'Oh!' said Sir William, 'don't do that, for if you speak I shall have to stop and reply, and I particularly want to keep my engagement this evening.'

"'Well,' replied my father, 'I will make a bargain with you if you like. If you will agree to put money in next year's estimates to complete the Temperate House at Kew I will pair with you for as long as you wish.' And Sir William Harcourt, nothing loath, assented.

"My father at once communicated this to Sir William Thiselton-Dyer; but when the next year's estimates came out Sir William found to his horror that the money for the Temperate House had been struck out. He appealed to my father, and my father to Sir William Harcourt, and the Chancellor, recognising that a bargain was a bargain, directed that a supplementary estimate should be brought in to provide the promised funds.

"I once suggested to the present Mr. Lewis Harcourt that this characteristic Parliamentary anecdote should be recorded on the Temperate House itself."

Kew and the War.—Of the two hundred and five men serving in various capacities on the staff of the Royal Botanic Gardens, one hundred and fifty are between the ages of 18 and 45. Of these up to the present forty-six are now serving with His Majesty's forces on land or sea. At the outbreak of hostilities ten men, Reservists and Territorials, were summoned to the colours. Two of these were members of the Royal Fleet Reserve, and two members of the Territorial force.

Four ex-soldiers have rejoined the colours as instructors in the New Army. Three of these were members of the uniformed section (two constables and one museum porter), and one from the labour force who had seen long service in India. Six ex-soldiers have also rejoined the ranks.

Twenty-six members of the staff have enlisted either in the Army itself or in the New Army since the beginning of the war, and the recruits have been as follows:—

Foreman, 1.	Herbarium Porters, 2.
Sub-foreman, 1.	Labourers, 6.
Young Gardeners, 10.	Carters, 2.
Garden Boys, 3.	Horse Boy, 1.

One of the young gardeners has already been promoted to the highest rank among the non-commissioned officers. It should be pointed out that one young gardener was already a member of the Territorial force, and is counted among those called out at the commencement of the war.

Transmission of Cuttings from Abroad.—Some remarks on this question were published in the *Kew Bulletin* of the present year, see "Hints for Collectors," p. 98. Supplementing them, the following observations, suggested partly by directions given in a valuable publication of the United States Department of Agriculture, entitled "How to send living plant material to America," are now offered.

The term cutting should be taken to include also "scions," or pieces of living branchlets used for grafting. It is more often possible to establish imported twigs as grafts on stocks of an older species of the same genus than it is to make them take root on their own account. In selecting pieces to send, they should, if from deciduous trees, be sent in the winter or leafless state, and they may be nine inches or more long. Growths well ripened and of average vigour should be chosen, neither too gross and sappy on the one hand, nor too weak and twiggy on the other. Shoots scarcely the thickness of a penholder are on the whole the most convenient size for grafting, and in cases where the one-season wood is much more slender than that, two-season shoots should be sent. Cuttings for rooting are nearly always made of one-season wood. Shoots of woody evergreens, like hollies or oaks, if to be sent long journeys,

may have the leaves wholly or partially removed. One of the most important matters in connection with sending shoots for grafting or for cuttings is determining the right moistness of the sphagnum or other packing material. It should be moist but not saturated. The matter is, of course, dependent to some extent on the nature of the wrappings and their capacity for preventing escape of moisture, but the mistake of making the packing material too wet is more often made than is the reverse.

A useful method, especially when the cuttings have to be sent long distances, is to pack them in a ventilated box, with their ends (both top and bottom) bedded in clay balls, the middle part uncovered. The box should be of the right size to enable the cuttings to be packed across it all one way so that the clayed ends fit against the sides. In this way the uncovered middle part of the cuttings is in free air, and "sweating" is prevented.

Cuttings that arrive in a shrivelled but still living state should be submerged in water for a few hours to regain their plumpness.

Examples of genera, of which leafless cuttings for rooting may be safely sent long distances are: *Salix*, *Populus*, *Rosa*, *Ribes*, *Neillia*, *Spiraea*, *Tamarix*, *Cornus*, *Forsythia*. Root-cuttings, if the collector can secure them, would be useful of such genera as *Rhus*, *Ailanthus*, and others with fleshy roots.

As a general rule, leafless cuttings for rooting should reach England as soon as possible after the leaves have fallen. Grafts and root-cuttings need not arrive until spring. It need hardly be said that every precaution should be taken not to introduce in this way a new insect or fungoid pest.

Leafy summer cuttings of hardy trees and shrubs have been very successfully transported from America to England in the month of July. The cuttings were tied in small bundles of half a dozen or so and laid loosely in shallow baskets with damp moss about the stems, the leafy parts being left uncovered. The basket was then tied down with canvas. It is, of course, only possible to send over cuttings in this way by arranging with the purser or other officer on board ship that they may be kept in the cool storage. For hardy things it was found that a temperature of about 42° Fahr. was very suitable. Cuttings ten days in transit have been found to root well, but perhaps a fortnight is about the limit for this class of cutting. W. J. B.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the *Bulletin*:—

Mr. R. B. Rogers, Launceston.—Two photographs of naturally inarched branches of poplar, section of wood of green oak, and three large bunches of fruits of common walnut.

Curator, Botanic Station, Tobago.—Pods of *Canavalia caribaea*.

Mr. J. Harris, Swansea.—Section of trunk of *Rhododendron Falconeri*.

Director, Botanic Gardens, Singapore.—Photograph of selected tubers of varieties of *Manihot*, and two photographs of old tree of *Hevea brasiliensis* that had recently died in the Botanic Gardens, Singapore.

Mr. J. Yule, Cavendish Square, London.—Sample of coca leaves (*Erythroxylon Coca*) grown in North-East Rhodesia.

Mr. E. R. Pratt, Downham, Norfolk.—A collection of various woods including examples of cricket-bat willow grown under different conditions, also mounted specimens of species of *Salix*.

Sir A. H. Church, Kew Gardens.—Piece of cedar wood from the small temple at Nimroud.

Mr. A. Wigglesworth, London, E.C.—Sample of Indian (Baihata) flax.

Mr. W. P. Ellmore, Leicester.—Photograph of a willow-peeling scene.

His Grace the Duke of Richmond and Gordon, Gordon Castle, Fochabers.—Section of trunk of Scots pine, planks of larch, oak, Scots pine, also turned articles in yew and elm, steering wheel of oak and specimens of boat-building timber.

The Right Honourable the Earl of Moray, Darnaway, Forres.—Planks of Scots pine, larch, spruce, elm, sweet chestnut, beech, etc.

Sir John Stirling Maxwell, Bart., Pollok House, Pollokshaws.—Six photographs of high moorland planting.

The Marchioness of Graham, Easton Park, Wickham Market.—Plank of *Populus nigra*.

Sir John Dewar, Bart., Dupplin Castle, Perth.—Examples of mining timber, fencewood, sleepers, etc.

The Right Honourable the Earl of Leicester, Holkham Hall, Norfolk.—Examples of timber of Corsican pine grown on sand dunes, also mangle rollers and wooden shovels made on the Estate.

Director, Forest Department, Siam, per Phra Vanpruk.—A collection of fifty-two specimens of Siamese woods.

From the International Rubber Exhibition a large and varied collection of vegetable products was obtained from the following sections:—

Sudan Government.—Acacia gums, varieties of sorghum, cotton, rubber, oil seeds and oils, tree of *Acacia Senegal* with exuded gum attached, etc.

British Guiana.—Rubber, coffee, cacao, rice, nutmegs, etc.

West Indies, St. Vincent.—Samples of cotton, arrowroot, cacao, etc.

St. Lucia.—Sugar, nutmegs, mangoes, etc.

Dominica.—Coffee, rubber, vanilla, etc.

British Honduras.—Fibres, rubber, oil seeds, oils, etc.

British East Africa.—Cotton, coffee, fibres, rubber, etc.

Nigeria.—Gums, cotton, photographs, etc.

Ceylon.—Cocoa-nut products, rubber, tea, cacao, photographs, etc.

French Colonies.—Rubber, rice, cotton, etc.

Philippines.—Fibres, etc.

J. M. H.

Dichaeas from Costa Rica..—Living plants of several interesting Costa Rican Orchids, which had been collected in the neighbourhood of Cachi, were sent to Kew by Mr. C. H. Lankester in October, 1913. Among them are two very imperfectly known

species of *Dichaea*, which prove to be *D. histrio*, Reichb. f., and *D. brachypoda*, Reichb. f. The genus is very rarely seen in cultivation, and the identification of the plants has revealed a good deal of confusion which it is desirable to clear up.

Dichaea histrio, Reichb. f., was primarily based on a drawing by Lindley of a plant which flowered in the garden of the Horticultural Society at Chiswick in October, 1856, and which is said to have been sent from Mexico by Botteri. Lindley only made an enlarged sketch of the pedicel, lip and column, on a sheet containing a partly-coloured copy of an unnamed Brazilian drawing by Descourtilz, but he recorded that Botteri's plant was identical with the latter in the leaves and in the colour and the form of its parts. On another sheet in Lindley's Herbarium is a dried specimen collected at Jalapilla, Mexico, in October, 1854, by Botteri (n. 513), and with it a sketch of a flower from "Mexico, Graham," and these Lindley has labelled "*Dichaea echinocarpa*," but the determination must have arisen from a confusion, for *D. echinocarpa* was primarily based on the Jamaican *Epidendrum echinocarpum*, which is quite distinct. When Reichenbach described *D. histrio*, he remarked that it was identical with a plant that passed in commerce under the name of *Pachyphyllum procumbens*, which was a true *Dichaea*. This determination enables another doubtful plant to be cleared up, for this plant, though elsewhere recorded, has not been described, and has remained as an unknown *Pachyphyllum* down to the present. It may be added that Lindley's determination of Botteri's plant was accepted by Hemsley, who further overlooked *D. histrio*, and that the habitat of the latter is recorded in the Index Kewensis as "Venezuela."

The identity of Descourtilz's Brazilian drawing remains somewhat doubtful, but it apparently agrees with Brazilian specimens of *Dichaea muricata*, Lindl., also with *Limodorum pendulum*, Aubl., which Lindley wrongly included under his *D. echinocarpa*, a mistake which doubtless led Cogniaux to supersede *D. echinocarpa* instead of *D. muricata*, Lindl., by the new name of *D. pendula*, Cogn. *D. histrio*, Reichb. f., is nearly allied to *D. muricata*, but has invariably smaller, more closely arranged, leaves than the Brazilian plant.

The following is the revised synonymy of the species:—

Dichaea histrio, Reichb. f. in Nederl. Kruidk. Arch. iv. (1859), p. 330. D. echinocarpa, *Lindl.* Gen. & Sp. Orch. (1833), p. 208, in part; Hemsl. Biol. Centr. Amer. iii. p. 268, in part. Pachyphyllum procumbens, *Lodd.* Orch. (1844), p. 39; Loud. Hort. Brit. Suppl. 3, p. 601; Reichb. f. in Nederl. Kruidk. Arch. iv. p. 329.

Dichaea brachypoda, Reichb. f., Beitr. Orch. Centr. Amer. (1866), p. 78, was based on a specimen collected at San Miguel, Costa Rica, by Wendland, in May, 1857, the collector describing the flowers as light green with reddish spots. The species was said to be allied to *D. graminoides*, Lindl. (Isochilus graminoides, *Hook.* Exot. Fl. iii. t. 196), and the plant sent by Mr. Lankester agrees so well with the description as to leave little doubt as to its identity.

Further material of Central American Dichaeas, especially living plants or dried specimens with flowers, would be appreciated, as there are imperfect specimens at Kew which may indicate additional species, and others have been described which cannot be identified for want of materials. R. A. R.

Botanical Magazine for October.—The following plants are figured: *Ixora umbellata*, Valet. (t. 8577); *Cytisus pallidus*, Poir. (t. 8578); *Trichocaulon pictum*, N. E. Br. (t. 8579); *Indigofera Kirilowii*, Maxim. (t. 8580), and *Agave bracteosa*, S. Wats. (t. 8581).

The *Ixora* was introduced to cultivation at Kew from Java in 1889, whence it was sent by the late Dr. Treub. It is nearly allied to *I. congesta*, Roxb., but differs particularly in the corymbs of white flowers. As a wild plant *I. umbellata* appears now to be very rare in Java. In cultivation it forms a handsome branching shrub.

Cytisus pallidus, a native of the Canary Islands, was raised at Kew in 1912 from seed sent in that year by Dr. G. V. Perez, of Puerto Orotava, Teneriffe. This plant has been depicted by Webb and Berthelot under the name *Genista splendens*, in their work on the Canary Islands. It is nearly allied to *C. linifolius*, Lamk., from which it differs in the broader leaflets. It is a particularly pleasing plant with its silvery pubescent leaves and fragrant yellow flowers.

Trichocaulon pictum is a remarkable Asclepiad from Little Namaqualand, originally discovered by Dr. R. Marloth, and subsequently found again by Prof. H. H. W. Pearson and sent to Kew with many other interesting succulents collected during the course of the Percy Sladen Expedition. In the vegetative condition our plant can hardly be distinguished from *T. cactiforme*, N. E. Br., but so distinct are the flowers that they cannot be regarded as conspecific. It flowered at Kew for the first time in June, 1912.

To China we are again indebted for another pretty garden shrub. *Indigofera Kirilowii*, a native of North China, has been received both from Mr. M. L. de Vilmorin and from Prof. Sargent. The flowers are a delicate pink colour, and are developed continuously from the leaf axils during June and July. This species was referred first by Bunge to *I. macrostachya*, but its nearest ally appears to be *I. elliptica*, Roxb.

Agave bracteosa, the subject of the last plate, is a very distinct species of the section *Littaea*. *A. pruinosa*, Lemaire, is its nearest ally, and has similarly finely dentate leaves, but in *A. bracteosa* the leaves gradually taper upwards from a short thickened base. This species was discovered by Dr. E. Palmer near Monterey in Northern Mexico, and was introduced by him to the Harvard Botanic Garden, where it flowered for the first time in 1881. The plant which furnished material for the plate was received in 1888 from the Botanic Garden at Washington.

Solanum Wrightii.—A specimen of *Solanum Wrightii*, Benth., has been received from Mr. C. J. Lucas, who has collected it at Ketito, about 50 miles from Nairobi, British East Africa, where it formed a tree 20 ft. high, with the branches spreading 15 ft., and was known as the "Tree Tomato." It was first described by Bentham in the Flora Hongkongensis, p. 243 (1861), from material obtained from the Murray Barracks, Hong Kong, by Charles Wright, naturalist to the United States North Pacific Exploring Expedition, during his visit there in 1854, and was then known as the "Potato Tree." The ground on which the barracks stood has now been built over and the tree probably destroyed, as specimens have not been sent by any subsequent collector. It has since been ascertained to be a native of Bolivia, whence specimens were received at Kew from Pearce, who collected it on the banks of the Amantala and called it the "Egg Tree," and at Guanai by M. Bang. Carrière, who published a good coloured figure of the plant in the Revue Horticole, 1867, p. 132, confused it with *C. macranthum*, but it differs totally from the two Brazilian species of that name described by Dunal and Hooker respectively. Dunal's plant is imperfectly known, while Hooker's has been reduced to *S. maroniense*, Poit. A third species described under the name *S. macranthum* by Martens and Galeotti is the Mexican *S. porphyranthum*, Dun.

C. H. W.

Cauto Cotton.—A brief account of this important plant was given in *Kew Bull.* 1914, pp. 198–199. The following additional particulars are furnished by Mr. W. Harris, Superintendent of Public Gardens and Plantations, Jamaica, in a letter dated July 16th, 1914:—

"Cauto Cotton is an interesting plant and promises to be a valuable agricultural crop for dry districts. Here, at Hope, it was planted in the middle of August last, and the crop was picked from the middle of February to 1st May this year, the yield being 600 lbs. of seed cotton per acre.

"The plants are growing at 8 feet by 8 feet, and had they been planted at 4 feet by 4 feet for the first year and then thinned out to 8 feet by 8 feet the yield would have been much heavier. They are now bearing a fine ratoon crop, and it is said that they yield good crops for at least three years.

"There are 50 acres of this crop on the limestone in Lower Clarendon, an exceedingly hot and dry district, and they have made excellent growth, even better than ours at Hope where the soil is a light gravelly alluvial.

"The yield of lint from some of the Clarendon cotton was 36 per cent., and the 1914 crop has been sold in U.S.A. at 18 cents per lb., whilst the ratoon cotton grown in Cuba and ginned in Jamaica was markedly superior to the plant staple and fetched 25 cents per lb."

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9] [1914

LVIII.—NOTES ON THE NATIVE PLANTS OF THE AZORES AS ILLUSTRATED ON THE SLOPES OF THE MOUNTAIN OF PICO.

H. B. Guppy, M.B.

It does not seem easy to obtain a short general account of the native vegetation of the Azores. Much as has been written on the Azorean flora it is difficult to procure many data concerning the relative frequency, the mode of occurrence and associations of the native plants except from the earlier writings of Seubert, Hochstetter, Drouet, and Morelet. With some diffidence the author endeavours in this brief sketch partly to supply these deficiencies; but in this short space it will be only possible to touch very lightly on subjects which he hopes to deal with in detail in a subsequent publication. The monographs of Seubert in 1844, of Watson in 1870, and of Trelease in 1897 form landmarks in the history of the investigation of the flora. But many have laboured to supply the materials, and here we may mention Guthnick, the Hochstetters (father and son), Godman, Hunt, C. S. Brown, Sampaio, Carreiro, Machado, and Chaves.

During his two sojourns in this group, from the middle of February to the end of April, 1913, and from the middle of June to the middle of August, 1914, the author was principally engaged in investigating the altitudinal ranges of the plants. After familiarising himself with the flora in a stay of about three weeks on San Miguel (St. Michael), during which he ascended the principal mountains and enjoyed the privilege extended to him by the officials of the Municipal Museum at Ponta Delgada of consulting the herbarium, he visited Pico and remained on the mountain from the second week of March to the second week of April, 1913. During his second sojourn in the group in 1914 he stayed on the island of Pico from the end of June to the second week of August, a period of six weeks, of which the first four were passed on the mountain and the last two in the district of Caes-o-Pico and

(3476.) Wt. 225–595. 1,125. 11/14. J.T. & S. G 14.

Praynha do Norte. The only other island examined botanically was Terceira; but this visit was confined to a single ascent of Santa Barbara, the principal summit.

Two ascents were made to the summit of Pico, 7613 ft. above the sea, namely, on April 1st, 1913, and on July 16th, 1914; whilst several ascents to altitudes of between 5000 and 6000 ft. were carried out on the north, east, south, and west sides of the peak; and, in addition, numbers of excursions were made on the lower slopes. A word may be said here on the best plan of exploring the mountain. The usual route to the summit from Magdalena by the Serra, past the Lomba, and up the south-west side of the peak is the worst that could be chosen by the botanist, since it does not bring him in contact with the upper woods. The constant employment of this route has been unfortunate for the botanical exploration of the mountain, and largely explains how it came about that it was left for the author to be the first to discover one of the most interesting plants in the Azorean flora in the form of *Arceuthobium oxycedri*, a parasite on the Juniper all round the mountain. The best plan is to examine the southern slopes from San Mattheus, whence an ascent to the summit and back can be easily made in a day, the western slopes from Magdalena, and the northern slopes from Bandeiras and Caes-o-Pico; whilst the easiest way to explore the eastern and especially the south-eastern slopes, where the upper woods attain their greatest development, is to avail oneself of a house used as a creamery and situate about 2500 ft. above the sea in the middle of the island's breadth between Caes-o-Pico and San Joao. The author's experience of a tent on the upper slopes is not such as would lead him to recommend its use to others. Though summer is naturally the most appropriate season, much can be done by the botanist on Pico in the winter months, since the woods are of evergreen shrubs and trees, and the lower snow-limit encroaches but slightly on the wood-zone.

If one excepts the Hochstetters in 1838, but few botanists seem to have made a prolonged stay on the mountain. Watson accompanied the surveying party from H.M.S. Styx to the summit in 1842 and made one or two lesser ascents. Trelease gives no idea of the length of his stay on Pico during his visits to the group in the summers of 1894 and 1896. Watson, who hardly mentions the subject of the vertical range of the plants on Pico in his monograph in Godman's book on the Azores, gives some particulars in a paper in the London Journal of Botany for 1843, but he expressly states that the conditions did not allow him to obtain exact information on the subject. Trelease does not allude to the matter. The author was therefore surprised to find that excellent accounts of the vertical distribution of plants on Pico are to be found in the writings of Seubert (1844), C. Hochstetter (1843), and Morelet (1860), and that Drouet (1866) gave many details of importance. Morelet and Drouet were two French zoologists who spent four or five months in the group in the summer of 1857 and were both much interested in the plants. The first-named made the ascent of the peak; but the latter's strength failed him, and he turned back when about half way up the mountain. However, it

is to the Hochstetters that we are most indebted for information on the subject. It was with mingled feelings of satisfaction and disappointment that the writer discovered that all his main results were in close agreement with those of the German investigators and of their later fellow-workers in this field.

The great volcanic cone of Pico, 7613 ft. in altitude, is by far the highest mountain in the Azores, none of the other islands attaining half its height. There are eight other islands in the group, and it is very remarkable that the three largest and most elevated of them have practically the same elevation, San Miguel 3570 ft., Terceira 3500 ft., and San Jorge 3498 ft., whilst the two islands next in size, Fayal and Flores, are not much lower, their heights being 3351 and 3087 ft. respectively. This is a physical feature of importance, since Pico loses the advantage of its much greater elevation on account of the predominance of lava and cinders in its upper portion; and for purposes of comparison as concerning suitable soil-conditions for vegetation we may regard only its lower 4000 or 4500 ft. Even on the island of Pico the same rule applies, since with the exception of the peak none of the other mountains exceed 3500 ft. in height. It is true that Pico Topo behind Lagens is credited in the Admiralty chart and in the accompanying Sailing Directions with an altitude of 5357 ft.; but there is an error here, the true elevation as the author ascertained being about 3300 ft.

From what has been just said we should be safe in assuming that the soil-conditions for forest-growth in the Azores cease usually at altitudes between 3000 and 4000 ft. It would seem from the early accounts of Madeira that the original forests must have extended nearly to the summit of the island, and we will take their average limits as between 5000 and 6000 ft. In the Canaries, as illustrated by Teneriffe, this limit would be generally about 7000 ft. After applying to these values for the three Macaronesian groups the correction for the difference in latitude and for the associated differences in climate we should expect to find in the Azores the Canarian forest vegetation of between 2000 and 5000 ft., or in other words the evergreen shrubs and trees of the Laurel belt. We could scarcely look for more, since the higher Pine belt of Teneriffe could not exist on the lava and cinders of the higher levels of Pico, whilst the lower coast belt with all its strange plants would be unrepresented for lack of the warm climatic conditions. The significance of this inference will become apparent in a later page; but it is by no means a novel one. It will be found in the pages of Seubert, Hochstetter, and Morelet, and is implied in the writings of Hooker.

The characteristic appearance of the great cone of Pico is that of a mountain rising with easy slopes for its lower two-thirds and then ascending precipitously to the summit. Except on the southern side it rises gently up to between 2000 and 2500 ft.; after which there is a steeper gradient to between 4500 and 5000 ft.; and then it ascends rapidly to the top. The impression formed at a distance that the lower two-thirds are vegetated, whilst the lava slopes of the upper third are barren, is verified only in a relative sense when the observer ascends the mountain.

The lower slopes are generally well vegetated up to altitudes of 4500 to 5000 ft., moorland predominating in their higher levels, that is, above 2000 ft. Woods are well developed in places, especially on the western and south-eastern sides. They are essentially formed by evergreen trees and shrubs; but on account of the persistent agency of the woodcutter through centuries the trees except when especially preserved do not usually exceed 20 ft. in height. Dwarfing of the trees and shrubs as a rule begins about 4000 ft. as the effect of deficient soil, and of exposure to the prevailing strong winds; but it is likely that in the early times forests of considerable height existed at this altitude.

Above the level of 5000 ft. the sparse vegetation of the precipitous upper third of the mountain presents a great contrast to the grassy and wooded plains below. On the crumbling lava and on the beds of cinders and coarse ashes that form its surface plants for the most part obtain a scanty hold. It is true, however, that dwarfed trees and shrubs climb the steep slopes for a few hundred feet, the scrub failing at levels short of 6000 ft.; but above that height vegetation is sparse and the plants become scarcer and scarcer as one nears the summit, some half-a-dozen reaching the terminal crater and its small cone.

Zones of Vegetation.—Before proceeding further the zones of vegetation on Pico may be here given. The arrangement does not vary materially from that of Seubert and Hochstetter, though different designations have been adopted.

(1) The Faya zone from the coast to between 2000 and 2500 ft. above the sea. The most abundant trees are *Myrica faya*, *Erica azorica*, and *Laurus canariensis*. Next in order of frequency come *Ilex perado*, *Rhamnus latifolius*, and *Picconia excelsa*, the last being now rare. *Taxus baccata*, at present almost extinct, would belong to the higher levels of this zone. The most characteristic shrubs in the same order of frequency would be *Myrsine africana*, *Vaccinium cylindraceum*, *Hypericum foliosum*, and *Viburnum tinus*. *Hedera canariensis* and a species of *Smilax* represent the climbers and *Rubus fruticosus* occurs in the undergrowth. *Osmunda regalis* is the most conspicuous of the ferns.

(2) The Juniper and Daphne zone, 2000 to 4500 ft. for the wood proper and 4500 to 5500 ft. for the scrub. The three most distinctive trees and shrubs of this zone taken in their order of frequency are *Juniperus oxycedrus* (var. *brevifolia*), *Daphne laureola*, and *Euphorbia mellifera* (Tree-Euphorbia). But *Erica azorica*, *Laurus canariensis*, *Myrsine africana*, *Ilex perado*, and *Vaccinium cylindraceum*, all of the lower zone, are here also abundant; and characteristic amongst the ferns are *Dicksonia culcita* and *Acrostichum squamosum*. *Arceuthobium oxycedri* is a common parasite on the Juniper trees.

(3) The Calluna, Menziesia, and Thymus zone, 5000 ft. to the summit. Mats of *Calluna vulgaris* and *Thymus Serpyllum* (var. *angustifolius*) predominate on these steep slopes of lava and cinders; but *Menziesia polifolia* is abundant. *Polygala vulgaris* also occurs with one or two grasses, as *Agrostis castellana*.

(4) The Upland Moors, 2000 to 4000 ft. This zone has been formed at the expense of the Juniper zone around much of the

mountain. Without differentiating here between the drier and wetter areas its most conspicuous features are the bracken (*Pteris aquilina*), the large tussocks of *Polytrichum*, and the beds of *Sphagnum*. Amongst the most frequent flowering plants are *Anagallis tenella*, *Erythraea Massoni*, *Hydrocotyle vulgaris*, *Luzula purpureo-splendens*, *Lysimachia nemorum* (var. *azorica*), *Polygala vulgaris*, *Potentilla tormentilla*, *Sibthorpia europaea*, *Thymus Serpyllum* (var. *angustifolius*), *Viola palustris*, and *Carex flava*. *Lycopodium Selago* is common, and there is an occasional scrub of *Calluna vulgaris*.

With regard to the prevailing climatic conditions it may be stated that the cloud-belt or rainy zone (2000–5000 ft.) corresponds roughly to the Juniper and Daphne zone and to the belt of the Upland moors. With reference to the higher levels between 6000 ft. and the summit (7600 ft.), although the character of the surface would primarily determine the type of plants adapted for such a rocky station, the choice would be further limited to plants capable of withstanding in a relatively dry atmosphere the fierce rays of the sun in summer, the severe cold of winter, and the stormy winds that prevail around these heights in certain seasons.

Whilst the rainfall would be much less than in the Juniper zone and in the moors, its deficiency would be partly compensated for by the heavy dews. The amount of sunshine must be considerably greater on the high levels than in the woody zone below. The mere concealment of the peak by the clouds when viewed from the coast by no means always implies that the summit is cloud-capt. Not infrequently, when the author had reached the upper limit of the cloud-belt through a driving wet mist, he found the upper third of the mountain exposed to the full glare of the sun under a clear sky and rising out of a billowy sea of clouds of dazzling whiteness like an island in the midst of arctic snows.

Although the daily range of temperature would be greater, it is very probable that the monthly means of the temperature of the air in the shade on the higher slopes of Pico would approximate those for the elevated region of Dartmoor in the south-west of England, between 1500 and 2000 ft. above the sea, a range, let us suppose, of from 33° in January to about 58° in July. Snow comes and goes on the peak at intervals during the winter and may lie for some time; but it is rarely of any depth except in the drifts. Its lower limit is generally about the 4000-ft. level; and in this connection it should be noted that on the summits of the other large islands, all of which reach a height of from 3000 to 3500 ft. above the sea, snow rarely lies. It is always winter for the people of the Western Azores whilst Pico wears its white cap. During the writer's stay on the mountain, from the second week of March to the second week of April, 1913, snow fell on at least three occasions; and for most of the time the peak was white with it. Different ascents were made up the snow-covered slopes, and in one of them (April 1st) he gained the summit.

General Account of the Vegetation.—Coming to a general account of the vegetation of Pico, and reversing the customary

order of description, we will imagine a botanist who, after alighting on the top of the mountain, descends to the coast. Upon the summit, not only at the borders of the small crater but also on the sides of its little cone (200 ft. in height), he would observe in the crevices of the bare lava-surfaces small stunted patches of *Calluna vulgaris*, *Thymus Serpyllum*, and *Menziesia polifolia*, with here and there a tuft of *Agrostis castellana*. Proceeding to descend the lava slopes on the south side he would very soon notice a few specimens of *Polygala vulgaris* growing for protection in the patches of Ling (*Calluna vulgaris*). He quickly reaches the shoulder of the mountain, a more or less level stretch of lava and lapilli, 6500–7000 ft. above the sea, where the Ling and the Thyme grow in dense mat-like beds, almost carpeting the surface in places, the first named, like the Thyme, only a few inches high. In the middle of July the Ling shows only the evidence of the last season's flowering, whilst the Thyme beds present a mass of bloom. It is on this shoulder of the mountain that St. Dabeoc's Heath (*Menziesia polifolia*) is most abundant and flowers copiously in July.

From the edge of the shoulder one looks down a precipitous slope of lava-flows, loose stones, and ashes, where the same plants occur, and often in large patches. One instinctively treads on the mats of Ling and Thyme, since they give a firmer foothold during the steep descent. There are few other plants, except the half-a-dozen above-named, that grow on these arid slopes above 6000 ft.

Very rarely one comes upon some straggler from the woods below growing from seeds dropped by birds in the crevices of a lava-cliff. Situated far above the ordinary upper limit of the rain-belt, exposed to the frosts of winter and unprotected against the intensity of the sun's rays in summer, such a plant has a hard struggle to hold its own. It was under such conditions, at an altitude of 6300 ft., that the writer found, in the middle of July, a few scattered individuals of the Azorean Holly (*Ilex perado*). Though they were scarcely over a foot high, their thick woody stocks indicated that they had been established for some years. They were in bloom; and it was interesting to notice how the axillary flowers were protected against the scorching heat of the sun's rays by the raising of the leaves which had assumed the vertical position and lay with appressed faces close to the stem. The expanding terminal leaf-buds were shielded by the same device; but more often than not it had proved ineffectual, and the buds were blackened and dead.

Our botanist has descended now to an altitude of about 6000 ft. Before he gets off the steep upper third of the mountain on to the wooded and grassy slopes of gentler gradient below he has yet to clamber down another thousand or fifteen hundred feet over old lava-flows, beds of cinders, and loose stones and boulders that when displaced bound for hundreds of feet down the mountain's side. But as he descends the conditions become a little more favourable for plant-growth. For a minute or two a driving mist envelops him and shuts all out from view. He has been in a wisp of cloud and is approaching the upper limit of the rain-belt.

Should he descend on the western side he will make but few

additions to his plant list until, at a level of about 5500 ft., he comes upon the outposts of the woods in the form of stunted bushes of the Tree-Heath (*Erica azorica*). On the eastern slopes of the mountain, where for some reason more humid conditions prevail, he will find as soon as he passes below 6000 ft. that the beds of Ling (*Calluna vulgaris*) afford protection to a variety of different plants. On these wind-swept slopes the Ling beds are only four or five inches high; and in them nestle dwarfed specimens of *Juniperus oxycedrus* flowering and fruiting as freely, though not over six inches in height, as the trees of ten or twelve feet in the woods below. On exposed peaks in this group, as may be observed on the summits of San Miguel, Terceira, etc.; one often finds a dense spreading growth of stunted Junipers rising only two feet from the ground, a feature also observed and well described by Watson (p. 224); but nowhere did the present writer notice the dwarfing process so pronounced as in the case of these tiny Junipers fruiting in the Ling beds on the bleak heights of Pico. Amongst the other flowering plants that find a sanctuary in these Calluna beds at this altitude are delicate herbaceous plants like *Polygala vulgaris*, *Erythraea Massoni*, and *Lysimachia nemorum*, and hardy shrubs like *Vaccinium cylindraceum*, which, however, instead of growing nine or ten feet high, as in the woods, is here reduced to five or six inches.

The impression one forms whilst descending these steep lava slopes of the upper third of the mountain is that many of the plants characteristic of the lower levels would reach the summit, if the soil-conditions allowed it. This was also the opinion of Morelet, the French zoologist, who ascribed the penury of the higher levels to the nature of the surface and the steep angle of the slopes. The repressive influence of the fierce winds that blow around these heights during much of the year would be mainly found in the dwarfing of the trees and shrubs. That several of the plants which are at home in the upper woods between 2000 and 4000 ft. can grow at levels between 5000 and 6000 ft. is shown in their readiness to find shelter at these heights in the small craters and gulches, in the broken-down lava-caverns, and in the numerous fissures and holes. Here we find the Tree-Euphorbia (*E. mellifera*), the Azorean Holly (*Ilex perado*), *Daphne laureola*, *Myrsine africana*, *Laurus canariensis*, etc., species that are not to be seen on the wind-swept slopes near by; whilst the Juniper and Vaccinium may be observed growing four or five feet high in a pit and only four or five inches high when exposed on the surface.

But apart from these sanctuaries on the higher slopes for the more adventurous plants of the woods below, stunted specimens of the Tree-Heath (*Erica azorica*), which form the outposts of the woods, sometimes ascend, as already observed, the lower slopes of the steep upper third of the mountain to between 5500 and 6000 ft. When we get off these steep slopes at a level from 4500 to 5000 ft. the soil-conditions become more favourable. Here the Tree-Heath begins to assert its arborescent habit, and it is associated with Juniper trees of fair size, the Juniper growing well on suitable ground at these altitudes.

We now enter the cloud-belt or rainy zone which in its limits,

2000–5000 ft., rudely corresponds to the upper mountain woods. Amongst the trees *Erica azorica* is often predominant, attaining its greatest development in the middle of the belt, and growing when left undisturbed to a height of 15, 18, or even 20 ft. In the open woodland bushes of *Calluna vulgaris* may be nearly as abundant. It is between 3000 to 4000 ft. that the upper woods display their best growth. Though on account of the woodcutter's destructive influence exercised through many generations the wood is small, the height of the trees not usually exceeding 15 or 20 ft., several of them when left alone can attain, as shown below, twice this height. Amongst the other characteristic trees and shrubs of the upper woods are *Laurus canariensis*, *Myrsine africana*, *Ilex perado*, *Daphne laureola*, *Vaccinium cylindraceum*, etc.; and here thrive as solitary specimens or in twos and threes the Tree-Euphorbias (*E. mellifera*). Indications of the prevailing humidity are displayed in the filmy ferns (*Hymenophyllum tunbridgense*) growing on the trunks of the larger Junipers and Tree-Heaths. In the shade flourish ferns like *Dicksonia culcita* and *Acrostichum squamosum*; whilst *Lycopodium complanatum* is here at home. Selaginellas and Liverworts often appropriate the interior of the lava-caverns, and the large fronds of *Woodwardia radicans* clothe the sides of the narrow gulleys. *Sibthorpia europaea* abounds in shady spots, and *Trichomanes speciosum* grows in the dampest situations. When long undisturbed the woods form dense thickets difficult to penetrate. Here thrives on the branches of the Juniper trees the Loranth (*Arceuthobium oxycedri*). This parasite grows commonly on the Juniper all round the slopes of Pico at elevations of from 2000 to 4000 ft.

One of the most interesting of the plants in the upper woods is *Daphne laureola*, which is usually restricted to levels between 3500 and 4500 ft. In the woods and thickets it displays a loose straggling habit; but when, as on the northern side of the mountain, it grows exposed on the moors near their upper limit, it presents itself as rounded dense bushes three or four feet in height. But it is a plant that even here seeks protection, and it selects the dips and hollows of the moors and gives a singular appearance to the landscape.

Numerous small craters and gulches in the upper-wood zone afford refuge to plants that under ordinary circumstances are confined to the lower woods. The vegetation of the small craters on the slopes of Pico is often especially luxuriant. When, as sometimes happens, the crater or gulch is inaccessible the plants grow to unusual heights, protected against injury from men and animals. Here, in a limited space, at altitudes of about 3500 ft., one may observe nearly all the trees and shrubs of the slopes of Pico from the sea-level up to 5000 ft., not only those of the upper woods but such plants as *Myrica faya*, *Rhamnus latifolius*, and *Viburnum tinus* (Laurustinus) that are ordinarily restricted to the lower woods. In these refuges the Tree-Euphorbias (*E. mellifera*) are particularly at home, and there flourish here many herbaceous plants, such as the handsome *Euphrasia grandiflora*, a tall *Verbascum*, *Sanicula azorica*, and species of *Habenaria*.

The dominant trees of the lower woods, that is below 2000 ft.,

are *Myrica faya*, *Erica azorica*, and *Laurus canariensis*. The dominant shrub is *Myrsine africana*. But *Rhamnus latifolius*, *Vaccinium cylindraceum*, and *Ilex perado* are also frequent. The Laurustinus (*Viburnum tinus*) is absent in some places and fairly well represented in others. The "Pao branco" (*Picconia excelsa*) is now very rare, its timber being much appreciated by the islanders. However, single trees may occasionally be noticed in the woods; but as a rule it finds a refuge in some inaccessible gulch or small crater. *Osmunda regalis* may be observed at levels exceeding 1000 ft. in moist surroundings at the margin of the woods. Amongst the tree climbers are *Smilax* and *Hedera canariensis*, the undergrowth being usually formed by species of *Rubus*, *Myrsine africana*, and the Ivy just named. In the open districts *Calluna vulgaris* is abundant.

But the lower-wood zone is essentially the zone of the Faya tree. Just as the Junipers are restricted to the upper woods, so *Myrica faya* is characteristic of the woods below and rarely extends much above 2000 ft., except it finds shelter in some gulch or small crater, as before described. The trees of the lower woods that reach the coast are mainly the Faya and the Tree-Heath. Two plants range through the whole height of the mountain, *Calluna vulgaris* and *Thymus Serpyllum*. They grow not only on the old lava flows as they reach the coast, but also on the lava surface of the summit and on various kinds of soil in the intervening levels.

There remains for consideration the vegetation of the upland moors, which are generally confined between the levels of 2000 and 4000 ft. They form a belt around the greater part of the mountain, but are crossed at intervals by strips of woodland. Lying as they do within the rainy zone their conditions are nearly as moist as those of the upper woods, and they largely usurp their place. They are used as pasture land for cattle, the lower portions being under private ownership; whilst the upper parts marked off by a high wall, usually about 3000 ft. above the sea, are known as the Baldios or Common-lands. These upland moors, which doubtless have been greatly extended by deforestation since the colonisation of the group, are characteristic of all the larger islands. In the association of their plants they display a striking resemblance to Dartmoor. Their surfaces on the slopes of Pico are often marked by linear copses of the Tree-Heath, presenting a variety of strange patterns, which look, from a distance, like huge hieroglyphs on a light green ground. Two objects have here been served. In availing himself of the natural growth of the trees the landowner has so trimmed and directed the growth of the original copse that, at the expense of as little ground as possible, he obtains shade for his cattle in summer and shelter from the cold winds in winter. In the other case, whilst clearing his land he has preserved the heath-trees when they are frequent near his boundary lines, and has allowed them to propagate themselves only on the borders of his property, the result being that his land is partially inclosed in a living tree-fence.

Except on the south side, where the mountain rises steeply from the coast to its summit, these upland moors have usually an easy

slope. The bracken (*Pteris aquilina*) and the tussocks of *Polytrichum* give a character to their rolling grassy surfaces. It is a pleasure to tread their springy turf after the rough descent of the precipitous scantily vegetated lava slopes above; and if it is summer the multitude of herbaceous plants in bloom will delight the eye. One may on the western side distinguish between the boggy lower areas, where *Sphagnum* flourishes, and the relatively drier upper levels where peat-mosses do not live; but more often the differentiation is not to be made, and one may stumble on a bed or a pocket of *Sphagnum* without much warning. On the drier ground thrive *Erythraea Massoni*, *Lysimachia nemorum* (var. *azorica*), *Luzula purpureo-splendens*, *Menziesia polifolia*, *Polygala vulgaris*, *Potentilla tormentilla*, and *Thymus Serpyllum*, with an occasional scrub of *Calluna vulgaris*. *Sibthorpia europaea* conceals with its foliage the shady side of pits and holes, but with the Lysimachia it is almost as common in the wetter areas. Terrestrial orchids (*Serapias*, *Habenaria*) are not infrequent, and the turf is dotted with single tufts of *Lycopodium Selago*.

The wetter areas, when of any size, are essentially *Sphagnum* moors, and the *Polytrichum* tussocks are here more numerous and larger (1½–2 ft. high, 2–3 ft. across), the peat-moss being often closely associated with them in their growth. *Anagallis tenella*, *Hydrocotyle vulgaris*, and *Viola palustris* grow in great abundance, and amongst the Carices *Carex flava* is the most common and sometimes almost monopolises the ground. It may be doubted whether the Bog Pimpernel (*Anagallis tenella*) exists in greater profusion in any part of its range than on the island of Pico. The writer has walked for miles on the mountain moors to the east of the peak, treading on its flowers at almost every step. In the tussocks, or rather hummocks, of *Polytrichum* nearly all the flowering plants of the wet moor in turn find a home, but *Hydrocotyle vulgaris* is most frequently to be noticed growing in their midst. The tussocks of *Polytrichum* by becoming confluent form in places dense beds nearly appropriating the ground. This is to be noticed on the northern side of Pico, where the moor-vegetation begins to ascend the steep upper third of the mountain.

The *Sphagnum* growth is in some localities very extensive, as on the south-west side of the mountain between the Serra Gorda and San Mattheus. For 1½ or 2 miles from the Serra the soil is stoneless and peaty, and *Sphagnum* forms dense growths, a foot high or more, around the bases of the shrubs of *Erica azorica* that here clothe the surface. The bushes, in fact, seem to grow out of Sphagnum tussocks. The significance of this association is not very obvious. Tansley, in his "Types of British Vegetation" (1911, p. 235), describes similar growths of *Sphagnum* around the bases of bushes and on the stools of *Phragmites* in the fen formation of East Norfolk, and he considers that the acids secreted by the peat-mosses would be neutralised by the alkaline ground-waters. In the coastal swamps of the Carolina region a large fern, *Woodwardia virginica*, grows out of low *Sphagnum* tussocks which are surrounded by standing water (Harshberger's "Phytographic Survey of North America," 1911, p. 441). The Pico locality, it should be noted, lies in the midst of a region of basic lavas

rather over 2000 ft. above the sea. In midsummer its surface is but slightly moist and large masses of dead peat-mosses are seen. In winter the ground would doubtless be very wet.

Here and there water collects in depressions of the boggy ground on these upland moors. Around the edges of the pools grow *Littorella lacustris*, *Peplis portula*, *Carex stellulata*, *Scirpus cernuus* and *Scirpus multicaulis* in proliferous condition. In the water thrive *Callitriche aquatica*, *Potamogeton polygonifolius*, and *Scirpus fluitans*. Around the large lakes lying to the east of the peak in the mountainous region behind Caes-o-Pico, Praynha do Norte, and Santo Amaro, and elevated between 2500 and 3000 ft. above the sea, one can sometimes recognise a succession of formations. Whilst the *Potamogeton* above named occupies the shallows, *Scirpus fluitans* monopolises the soppy ground at the lake's border, and outside this is a broad belt of *Sphagnum* where *Scirpus multicaulis*, *Carex flava*, *Anagallis tenella*, and *Hydrocotyle vulgaris* thrive. Sometimes a tall form of *Scirpus palustris*, two feet high, grows in the shallows.

Littorella lacustris and *Isoetes lacustris* (var. *azorica*) are common around some of these large mountain-lakes. Both display two forms, a dwarfed form on the exposed mud-flats and a large form with long cylindrical leaves, the latter growing either in the deeper water (*Isoetes*) or where the water just covers the ooze at the lake's margin (*Littorella*). Whilst the dwarfed plants of *Littorella lacustris* were well in flower in the end of July, the large plants were showing the flower buds; the latter possess leaves, six to nine inches long, which lie prostrate in the water and not erect as is sometimes described. It was evident that the floating growths of *Potamogeton polygonifolius* are inimical to the growth of the large forms of *Littorella lacustris* and *Isoetes lacustris*. They are rapidly extending in the ponds and lakes of this island, and not improbably will ultimately exterminate the last-named species. Almost all of the above-named aquatic and subaquatic plants flourish in one or other of the numerous small crater-lakes in the island, which, it may be added, have often *Sphagnum* borders.

All the plants dealt with in the foregoing pages would be regarded as indigenous. The native flora of the Azores was probably extremely limited. The group has been colonized for more than four centuries, and during that period multitudes of species have been introduced, either by accident or by intention. Trelease considers that most of the existing plants have been introduced largely through human agency since the discovery of the islands (p. 87); and one cannot be many weeks in the group without recognising the correctness of this opinion. Watson's list of 439 flowering plants was increased by Trelease to about 560; but I should imagine that the original flora did not comprise 200 species and that the plants that gave their impress to the vegetation did not amount to a hundred. The matter cannot be treated here; but by restricting the field of discussion to the native plants it is evident that we assume a very great reduction in the size of the flora that has often been described as indigenous to the Azores.

Watson, though he did not elaborate the point just touched

upon, gives some valuable suggestions (p. 268) regarding the composition and general nature of the original forests of the archipelago. We may be allowed here to emphasise his opinion that evergreen shrubs and trees, with ferns and mosses, formed the principal features of the vegetation, and that "a close forest of evergreens must have formerly covered the ground." After a few weeks in the islands, the present writer found himself unconsciously restoring the evergreen woods that once predominated in the group. Except as concerns the genera *Taxus*, *Euphorbia*, *Smilax*, and *Rhamnus*, his list corresponds with that of Watson, though only the species regarded as most characteristic are below named.

Amongst the trees, *Erica azorica*, *Laurus canariensis*, *Myrica faya*, and *Juniperus oxycedrus* would have been most frequent. *Ilex perado* would have been well represented, together with *Picconia excelsa* and *Taxus baccata*, both of which are rare in the existing forests. *Rhamnus latifolia*, a sub-evergreen, doubtless took its share, and the Tree-Euphorbia (*E. mellifera*) was probably more frequent than it is at present. Amongst the evergreen shrubs, *Myrsine africana*, it is likely, took a leading part; *Vaccinium cylindraceum* was abundant; and whilst *Daphne laureola* flourished in the upper woods, *Hypericum foliosum* was frequent in the lower woods. The Laurustinus shrub (*Viburnum tinus*) was well represented in places, and climbers like *Smilax canariensis* and *Hedera canariensis* were conspicuous. One cannot, however, pursue this subject further here, and brief reference will now be made to another feature of the original evergreen forests.

It is apparent from the old Portuguese and other authorities of the 16th century quoted by Walker, such as Fructuoso, Cordeiro, and Linschoten, that the islands were once heavily timbered. Fructuoso speaks of the dense and lofty woods of cedars (*Juniperus*), fayas (*Myrica faya*), and laurels on the slopes of the valley of the Furnas in San Miguel in the 16th century. Linschoten writes of the abundance of the "excellent and princely wood" of the "teixo" (*Taxus baccata*) on Pico in the same century. Walker also quotes the works of the old historians to the effect that, as on Terceira, the timber of the cedar (*Juniperus*, the "cedro" of the present islanders) was often employed for the beams and roofs of churches. The last record, he says, of these "magnificent" Azorean cedars belongs to the first part of the 17th century; and nearly all the old timber trees of the Azores seem to have disappeared before the close of that century. He mentions the occurrence of large trunks of the cedar and other trees lying buried in volcanic ashes on San Miguel; and in this connection Trelease (p. 169) remarks that "large logs, apparently of this species (*Juniperus*), occur deeply buried" under volcanic debris in one of the large craters of that island. "From the boles occasionally unearthed at the Seven Cities and Furnas (writes Walker, concerning San Miguel, p. 25) there is little doubt that these splendid trees, on its first discovery, inhabited a high belt of country extending east and west along the island." According to the same authority, specimens of the Tree-Heath and of the Faya of giant proportions and in a state of lignite have been

exposed in the ravines of San Miguel, pp. 219, 220. We also learn from him that "immense cedar trees" are occasionally found embedded in the ravines and valleys of Terceira (p. 253). One hears of the occurrence in the other islands, such as Flores, Pico, and San Jorge, of buried trunks of "cedar" of huge size.

The whole subject of these buried trees in the Azores requires systematic investigation; but there can be little doubt that the group possessed an abundance of excellent native timber in the early centuries of its occupation, and that it has none now. We would be unable to find in our own days any native trees large enough to supply timber for roofing churches. Men, goats, and cattle have been active agents in deforesting these islands for four hundred years and more. Pico, as we learn from Walker (p. 84), was at one time "densely covered with timber of large size." Except when specially preserved, it would be difficult to find trees more than 20 ft. high and more than thirty years old on that island now.

One can scarcely be surprised that authors, judging the past from the present, should write depreciatingly of the original forests of the Azores. Godman characterises them as "underwood" (p. 4); and Watson, when referring to their features (p. 268), speaks of the "frutescent and sub-arborescent" species and of the "shrubs and small trees" of which they were composed. Correcting Seubert's description of *Myrica faya* as a tall tree, he says that, according to his recollection, it would be more truly described as a dense bush (p. 224). He might have seen them 35 to 40 ft. high in the gardens around Ponta Delgada.

It was the fact just mentioned that led me to investigate the subject on the island of Pico. Land is there valued for the wood upon it, and it is profitable for the owner to leave his land undisturbed for many years. The great demand for wood for firing and other purposes usually prevents this being done; but in two of these "preserves" at the back of Magdalena, where the larger wood was made up entirely of *Myrica faya*, *Laurus canariensis*, and *Erica azorica*, the trees of the two first named commonly attained a height of from 35 to 40 ft. and a diameter of from 12 to 15 inches, and those of *Erica azorica* a height of 25 ft. and a diameter of 11 or 12 inches. The Faya trees occasionally exceeded 40 ft., the maximum being 50 ft.; whilst the Tree-Heaths at times must have measured between 30 and 35 ft. in height.

It does not appear, however, that the present Juniper trees anywhere approach the size attributed to the "cedros" of the original forests. On Pico, a height of 15 or 16 ft. and a diameter of 15 to 18 ins. (in a very few cases 20 ins.) represent my maximum measurements. Rarely does the Azorean Juniper grow straight, the trunk being twisted and bent. It is likely that the finest specimens exist on the uplands of San Jorge. Judging from a photograph, kindly taken in my interest by Colonel Chaves, they might there attain a height of 18 or 20 ft. Mr. Ogilvie-Grant mentions the "grand old Juniper trees" on the higher levels of the same island (Novitates Zoologicae, xii. 1905).

Affinities of the Native Flora.—A few concluding remarks may now be made on the general affinities of the native flora of the

Azores as illustrated in the woods and in the mountain moors. Whilst the predominant plants of the moors are in nearly all cases European species that do not occur in either Madeira or the Canaries, most of the characteristic shrubs and trees of the woods are non-European, and either exist in the other two groups or are represented there by closely related species. Although the ancestors of these forest trees and shrubs were originally derived from Europe, it was probably at an earlier date than the moor plants which are still in touch with their European home. The forest plants concerned include, amongst others, *Ilex perado*, *Rhamnus latifolius*, *Vaccinium cylindraceum*, *Erica azorica*, *Picconia excelsa*, *Laurus canariensis*, *Euphorbia mellifera*, and *Myrica faya*. The moor plants comprise species of both wet and drier stations, and include *Viola palustris*, *Polygala vulgaris*, *Potentilla tormentilla*, *Hydrocotyle vulgaris*, *Calluna vulgaris*, *Menziesia polifolia*, *Sibthorpia europaea*, *Lysimachia nemorum*, *Anagallis tenella*, etc.

There are, however, indications that the Azorean native woods, non-European as they are as regards several of their shrubs and trees, have preserved in the case of some species the European connection. Interesting evidence is supplied by the presence there of *Daphne laureola*, *Viburnum tinus*, *Juniperus oxycedrus*, and *Taxus baccata*, all but the Juniper, which is also a native of Madeira and the Canaries, being alone represented in the Azores in Macaronesia. With the exception of *Taxus baccata* all grow in Marocco on the slopes of the Great Atlas at altitudes of 4000 to 6500 ft.; and since no other trees and shrubs of the Azorean woods are named in Ball's list of the plants of that region (Hooker's "Marocco," p. 425), it would almost appear that the Azores may have received in a recent age these species of *Daphne*, *Viburnum* and *Juniperus* by way of the Atlas Mountains. But it would seem that similar recent accessions to the Canarian flora may have been received from the same source. Thus, in *Daphne gnidium* we have a European species which is associated on the slopes of the Great Atlas with *Daphne laureola;* in *Viburnum rigidum* a species related to the Mediterranean and North African *V. tinus* through its Azorean form (Trelease, p. 118); and in *Juniperus oxycedrus* also a Great Atlas species.

This Juniper has developed in the Azores a short-leaved form, which is by some regarded as a distinct species. But observation of many living trees in that group convinced me that great variation prevails in this character, and that Watson's half-doubt about the validity of the specific distinction in *Juniperus brevifolia* is more than sustained. *Taxus baccata*, which has been almost exterminated by the islanders for the sake of its timber, still exists sparingly in the mountains at the back of Caes-o-Pico and San Roque in the island of Pico. We learn from Trelease that it formerly grew in workable size on Flores and Corvo and was exported as a source of royal revenue. The Pico islanders are familiar with the tree by reputation, though very few could have seen it growing in their woods. A lake in the mountains behind San Roque is still known by some as the "Lagoa das Teixas" (*Taxus*), though the tree must be almost extinct there now.

According to Walker the old writers of the 16th century described this tree, under the name of "Teixo," as abundant on Pico. In the Macaronesian archipelagos *Taxus baccata* has been only recorded from the Azores, and probably its seeds were originally brought by birds from South-western Europe.

A very singular African connection is displayed in the existence in the Azorean woods of *Myrsine africana*, one of the most predominant of the shrubs. It is a native and often a mountain plant of Inter-tropical and South Africa, Abyssinia, Arabia, and Central Asia. It is not even at home in Madeira and the Canary Islands, its nearest habitats being in Angola and Abyssinia. Its small berries are well suited for dispersal by frugivorous birds; but its isolated occurrence in the Azores is one of the puzzles of the flora.

It thus appears from the preceding remarks that, whilst the native plants of the upland moors of the Azores are European, and as a rule not found in either Madeira or the Canary Islands, those of the woods, whilst mainly non-European, are largely Canarian and Madeiran. But these shrubs and trees of the woods are Canarian in a special sense, since, with the exception of the Juniper, they are confined to the middle zone or Laurel belt of Teneriffe, which lies between the levels of 2000 and 5000 ft. The parallel between Pico and Teneriffe would be more complete in this respect if the soil-conditions of the upper part of the Azorean mountain had permitted the development of an extension of the Juniper belt far up its slopes above the present level of the woods, just as *Juniper oxycedrus* once thrived on Teneriffe above the Laurel belt. But on Pico the differentiation of the Juniper from the wood zone has been, for the reason just given, incomplete.

But the cone of Pico lacks much that is characteristic of the Peak of Teneriffe. It lacks the Pine belt on its upper slopes because the soil-conditions above the rain or cloud zone are unfavourable for the growth of coniferous forests. It lacks the lower or African zone and all its strange-looking plants, such as the Cactoid Euphorbias, the Dragon Trees (*Dracaena draco*), and *Plocama pendula*, as well as the large Sempervivums of the coastal precipices, the result mainly of climatic differences associated with a latitude some ten degrees farther north.

But to return to the similarities between the Laurel belt of Teneriffe and the woods of the Azores, there is a wider outlook of the question, such as Hooker presented in his "Lecture on Insular Floras" (1866) and in his discussion of the Canarian flora in his later book on Marocco (1878). He regarded the trees and shrubs of the peculiar American genera existing in the Canaries and in Madeira as the wreck of an ancient flora that existed in Europe in Miocene times and has since been driven out of that continent by the northern and eastern floras that now replace it there.

But presumably the Canary Islands and Madeira hold the wrecks of many floras. They possess a number of peculiar genera and representatives of genera now exclusively American as well as an abundance of peculiar species, all pointing to an age preceding that indicated by the non-European trees and shrubs that are common to all the three Macaronesian groups. It is probable that both the Canaries and Madeira are far older than the islands of the

Azores, which possess no genus of their own and relatively few peculiar species that are beyond suspicion. The waves of migrating plants that have in successive ages passed over this portion of the globe left their wash on the Canarian and Madeiran groups before the Azorean area became available for plant-stocking. If the proportion of peculiar species in the Azores amounts to one-tenth, it would be about one-sixth in Madeira, and one-third in the Canaries. It is, indeed, curious that the group that is almost in touch with the African continent displays the greatest evidence of differentiation, and that the group that lies almost in mid-Atlantic displays the least.

As is remarked by Hooker in his lecture on Insular Floras (p. 15), but few of the Azorean plants are suggestive of such revolutionary changes as are indicated in the Canarian and Madeiran floras. The flora, if we except *Myrsine africana*, *Campanula Vidalii*, and one or two others, contains but few "problem" plants; whilst the Canaries and Madeira present a host of difficulties of this kind. As Wallace recognised, in his "Island Life" and in his "Darwinism," there can be no hesitation in attributing the plant-stocking of the Azores to the existing agencies of dispersal. In the Canaries quite other questions are raised than those of dispersal, questions that may carry us far back in geological time. In the Azores, on the other hand, the plants present us with a story of to-day for the upland moor and of yesterday for the mountain wood.

SUMMARY INDICATING THE LEADING CONTENTS OF THE PAPER.

The author endeavours to describe briefly some of the most conspicuous features of the native vegetation of the Azores as illustrated on the mountain of Pico. In so doing, he directs attention mainly to the vertical distribution of the plants.

After pointing out that for purposes of comparison with Madeira and the Canaries the Azores should be regarded as presenting conditions for forest-growth up to levels of 3000 to 4000 ft. (p. 307) he gives the zones of vegetation (p. 308), (1) the Faya zone, up to 2000 or 2500 ft.; (2) the Juniper and Daphne zone, 2000–4500 ft.; (3) the *Calluna*, *Menziesia* and *Thymus* zone, 5000 ft. to the summit; (4) the Upland moors, 2000–4000 ft.

A reference to the climatic conditions (p. 309) is followed by a general account of the native vegetation of the mountain (pp. 309–315). Beginning with that of the summit and of the higher levels (p. 310), he then describes in their order the plants of the upper woods or Juniper and Daphne zone (p. 311), of the lower woods or Faya zone (p. 313), and of the Upland moors (p. 313).

After alluding to the relatively small number of indigenous plants as compared with introduced plants (p. 315), the composition of the forest of evergreens that clothed the islands at the time of their discovery is discussed (p. 316), and the early writers are quoted in support of the view that the trees of the original woods were of far greater size than at present. It is then shown that although in the existing woods the trees are of small size on account of the persistent agency of the woodcutter,

they attain respectable dimensions when allowed to grow undisturbed (p. 317).

With regard to the general affinities of the Azorean flora it is remarked that, whilst the plants of the upland moors are in the mass European species that do not occur either in Madeira or in the Canaries, most of the characteristic trees and shrubs of the woods are non-European and either exist in the other two groups or are represented there by closely related species (p. 317). It is suggested, in passing, that the European element in the woods was mainly derived by way of the Atlas Mountains (p. 318). The woods of the Azores, as regards their component trees and shrubs, are to be compared with the "laurel belt" that forms the middle zone of vegetation on the slopes of Teneriffe. The lower African zone and the higher region of pines as displayed on that mountain are not to be found in the Azores, their absence being due to lack of the requisite climatic conditions in the first case, and to want of suitable soil conditions on the high levels of Pico in the second case (p. 319).

Finally, it is shown that the marked endemism of the Canarian and Madeiran floras is but slightly displayed in that of the Azores. The revolutions in plant-life which are suggested by the presence in the other two groups of representatives of genera now exclusively American cannot be predicated for the Azores. On the contrary the Azorean plants supply us with a story of to-day for the upland moor and of yesterday for the mountain wood.

PRINCIPAL WORKS QUOTED ON THE FLORA OF THE AZORES.

(*a*) "Ubersicht der Flora der azorischen Inseln," by M. Seubert and C. Hochstetter, in Wiegmann's "Archiv für Naturgeschichte;" jahrg. ix. band i.; Berlin, 1843; accompanied by a large coloured plate illustrating the zones of vegetation on Pico.

(*b*) "Flora Azorica," from the collections and notes of C. Hochstetter and his son, by M. Seubert, Bonn, 1844.

(*c*) "Iles Açores (L'Histoire Naturelle)," by A. Morelet, Paris, 1860. The author was a zoologist who was also interested in the flora.

(*d*) "Catalogue de la Flore des Iles Açores," by H. Drouet, Paris, 1866. The author, like Morelet his companion, was a French zoologist.

(*e*) "Natural History of the Azores," by F. du C. Godman, London, 1870. It contains Watson's monograph on the flora.

(*f*) "Botany of the Azores," by H. C. Watson, appearing in Godman's work, above-named.

(*g*) "Azores," by W. F. Walker, 1886. One of the most important general works on the Azores.

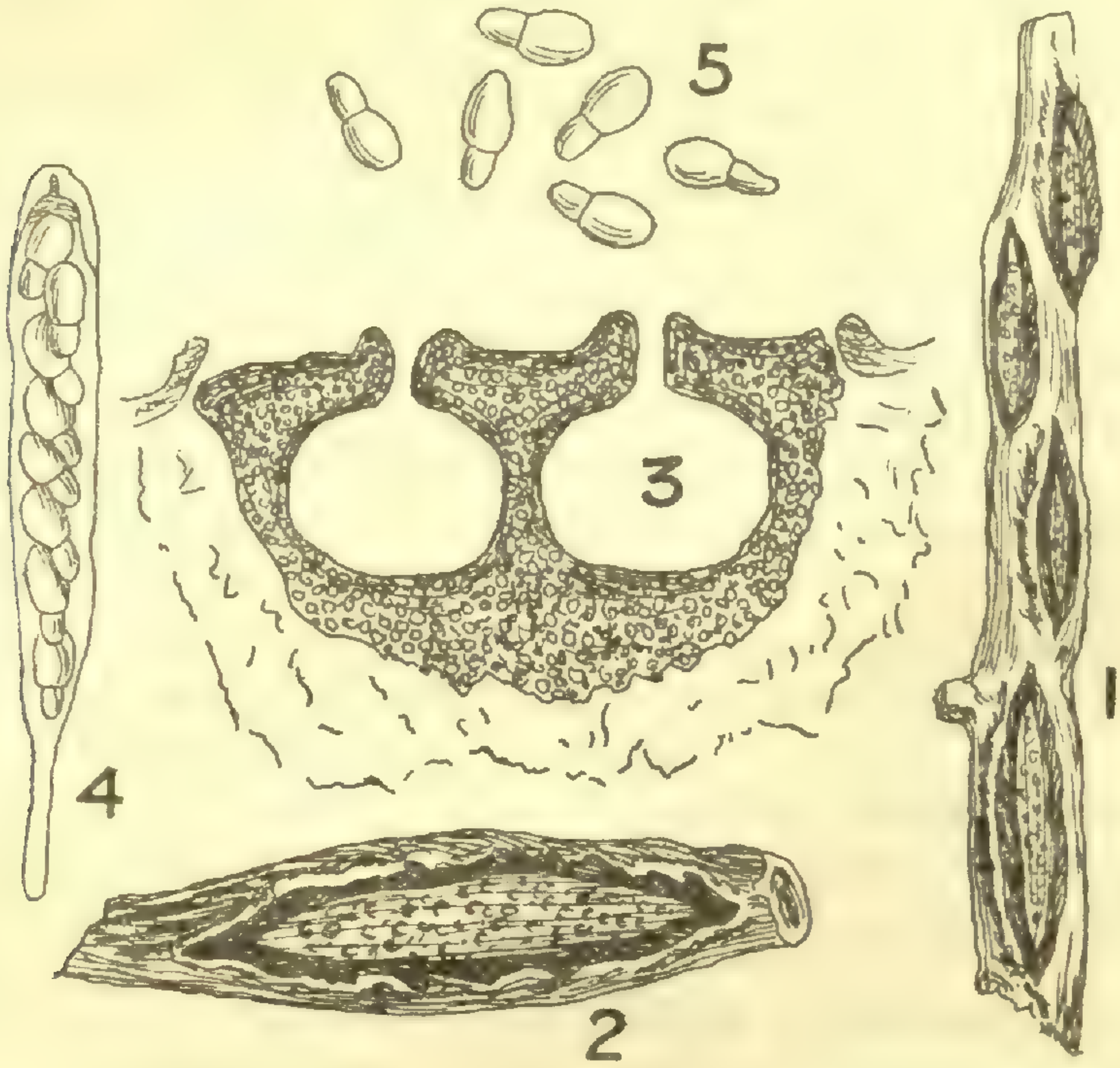
(*h*) "Botanical Observations on the Azores," by W. Trelease. 8th report of the Missouri Botanical Garden, St. Louis, 1897.

LIX.—BLACK-KNOT OF BIRCH.

G. Massee.

A disease attacking birch trees is just now much in evidence in some parts of Scotland, and is probably widely distributed in this country, as specimens collected at Eltham in Kent, and in Yorkshire are now in the Kew herbarium. The disease is also present in Sweden, Switzerland, Finland and Germany. A fungus called *Plowrightia virgultorum*, Sacc., is the cause of the disease. The genus *Plowrightia* includes some destructive parasites, amongst others *P. ribesia*, Sacc., producing Gooseberry black-knot, not uncommon in this country, and *P. morbosa*, Sacc., the cause of the dreaded black-knot disease of plum and cherry trees in the United States and Canada. The last named disease is at present unknown in Europe. Shoots and branches of birch from one to four years of age are attacked, the fungus gaining an entrance through the lenticels. After infection a black stroma is gradually formed which extends completely through the thickness of the cortex, but is checked when it reaches the wood. The diseased patches are narrow, and elongated in the direction of the long axis of the branch, varying from a quarter of an inch to an inch in length by two lines to a quarter of an inch in breadth. During the first season of infection the surface of the stroma is flush with that of the shoot, and is covered with a dense blackish olive layer bearing myriads of very minute conidia. At a later stage the stroma increases in thickness, becomes hard and carbonaceous, and produces the higher or ascigerous form of fruit. As the branch continues to increase in thickness after infection, the patches of fungus become surrounded by a wall of tissue, and eventually present the appearance of blackened patches occupying the bottom of a more or less deep, elongated pit. Owing to the facility for infection, due to the lashing together by wind, of healthy and diseased branches, the points of infection are usually numerous on each shoot, and are readily distinguished by the gouty or knotted appearance presented. The first indication of disease is the wilting and yellowing of the leaves, followed by the death of the branch. Trees that have been diseased for some time present a peculiar and characteristic appearance. Owing to the death of the terminal shoot, numerous lateral branches are produced, the lead of each one in turn being killed by the fungus; a repetition of this process results in the production of more or less dense tufts of stunted branches bearing a superficial resemblance to "witches' brooms."

The only means that can be suggested for the arrest of this disease is the removal of infected branches.



Description of the Figures.

1. Portion of diseased branch; natural size.
2. Portion of diseased branch; × 3.
3. Section through stroma, showing two perithecia; × 100.
4. Ascus containing eight spores; × 300.
5. Free ascospores; × 400.

LX.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECADES LXXXI.-LXXXII.

801. **Talauma singapurensis,** *Ridley* [Magnoliaceae-Magnolieae]; *T. gigantifoliae* et *T. lanigerae*, Hook. f., affinis, sed ab illa petiolis longioribus, ab hac foliis majoribus, ab utraque pistillis glaberrimis differt.

Frutex validus, 6 m. altus. *Folia* magna, rigide coriacea, oblanceolata, acuminata, versus basin angustata, 37 cm. longa, 11 cm. lata, adulta glabra costa hirsutula excepta, nervis 14–15-paribus subhorizontalibus, reticulationibus in utraque pagina conspicuis, petiolo 2·5–4 cm. longo basi incrassato. *Pedunculus* validus, 10 cm. longus, brunneo-sericeo-hirtus. *Sepala* ovata, lanceolata, brunneo-sericeo-hirta, 4 cm. longa, 2 cm. lata. *Petala* glabra, lanceolata, acuminata, acuta, coriaceo-carnosa, alba, 6–7 cm. longa, 3·5 cm. lata. *Staminum* filamenta brevia; antherae lineares, appendice acuminato-acuta. *Pistilla* glabra. *Fructus* 7 cm. longus, lignosus. *Carpella* 3 cm. longa, parte

basali 2 cm. lata, pustulata, superne parce lenticellata, stylo ad apicem convoluto. *Semina* in utroque carpello 2, irregulariter elliptica vel ovata, complanata, pallide brunnea, laevia.

Malay Peninsula. Singapore: Angmokio; Bukit Mandai Road, in forest swamps, *Ridley* 3656: Chan Chukang, *Ridley* 5091.

In its large stiffly coriaceous leaves, and large acuminate flowers this handsome shrub resembles *T. gigantifolia*, Miq., of Borneo and Sumatra, but from this, which is described as a tree, it differs in its petioles being much longer and the pistils perfectly glabrous at all stages. From *T. lanigera*, Hook. f., it differs in its larger flowers and much larger leaves, and also in its perfectly glabrous pistils, which in both of these species are covered with dense yellow silky hairs. The plant appears to be confined to the south of the peninsula, where it occurs in low swampy forest. *T. lanigera*, Hook. f., a small tree, occurs in Penang, where Curtis collected it, in Malacca (Griffith), and at Larut in Perak. A specimen in Herb. Kew, labelled "Singapore, 1867," by Maingay, is the only record from the island, and perhaps is wrongly localised.

802. **Goniothalamus caudifolius,** *Ridley* [Anonaceae-Mitrephoreae]; *G. tenuifolio*, King, affinis, sed foliis basi rotundatis, nervis prominulis supra depressis, floribus minoribus distinctus; a *G. Kunstleri*, King, quoad nervationem subsimili foliis multo minoribus et floribus minoribus differt.

Frutex, ramis gracilibus velutino-pubescentibus. *Folia* elliptica, acuta vel saepe caudata, apice obtusa, basi saepissime rotundata, membranacea, glabra, 11·5 cm. longa, 2·5 cm. lata, nervis 7–10-paribus supra depressis subtus elevatis, petiolo 3 mm. longo crassiusculo glabro. *Flores* singuli, extra-axillares; pedicelli crassi, 6 mm. longi. *Sepala* ovata, acuta, basi rotundata, lata, membranacea, nervosa et reticulata, hirta, praesertim in marginibus. *Petala* exteriora lanceolata, in utraque pagina pubescentia, 1·5 cm. longa, interiora ovata, obtusa, conniventia, 0·7 mm. longa, pubescentia. *Stamina* numerosa, angusta, linearia, appendice connectivi late conico obtuso. *Ovaria* plura, glabra.

Malay Peninsula. Perak; Pondok Tanjong, *Burn-Murdoch*.

This species belongs to the series of *Goniothalamus* with membranous nerved and reticulated sepals, and in general form of leaf and nervation resembles *G. Kunstleri*, King; but the leaves of that species are more than twice as large and the flowers also are larger, and the petals shorter in proportion to the sepals. The appendage of the stamen is shorter and broader. The specimen is in poor condition, and the only nearly complete flower may not be fully developed.

803. **Hibiscus setinervis,** *Dunn* [Malvaceae-Hibisceae]; *H. anguloso*, Steud., affinis, foliorum nervis setosis nec tomentosis distinctus.

Herba elata, foliosa, vix ramosa, ubique dense setifera. *Folia* (3–) 5- (7–) lobata, circumscriptione rotundata vel ovata, cordata, 10–13 cm. longa, supra setulosa, subtus in nervis setosa, aliter

glabra; lobi triangulares, 3–6 cm. longi, acuminati, acute serrati; petioli foliis aequilongi. *Flores* racemosi, 4–6 (–10) cm. longi, purpurei; pedicelli floribus aequilongi, capsulis bis longiores; bracteolae 5, lanceolatae, 2-3 (–5) cm. longae, setiferae, primum marginibus cohaerentes sed flore crescente plus minusve disjunctae. *Calyx* spathaceus, deciduus, bracteolis brevior. *Corolla* generis. *Capsula* 4 cm. longa, ovata, acuminata, setosa. *Semina* globosa, 3·5 mm. diametro, lineis puberulis numerosissimis concentricis notata.

India. Madras Presidency: Malabar Division; Baba Budan Hills, *Law;* Brahmagiri Hills, 1350 m., *Beddome;* Wynaad, *Beddome;* Coimbatore Division; Nilgiris, *Wight* 205 (Kew Distr. No.), *Beddome*; Naduvattam, *Lawson*: Madura Division; Pulney Hills, *Wight* 203 (Kew Distr. No.); Pulney Hills, 1500 m., *Saulierè* 409.

804. **Reevesia formosana,** *Sprague* [Sterculiaceae-Helictereae]; affinis *R. thyrsoideae*, Lindl., a qua foliis non acuminatis valde obtusis, inflorescentia densa tomentella, pedicellis brevioribus, ramulis hornotinis stellato-pubescentibus differt.

Ramuli exstantes in toto ad 13 cm. longi, teretes, hornotini 3·5–6·5 cm. longi, 2–2·5 mm. diametro, annotini glabrati, laeviusculi, satis pallidi, 2·5–4 mm. diametro. *Folia* obovato-oblonga vel ovato-oblonga, basi rotundata vel inconspicue subcordata, apice obtusissima vel breviter late obtusissime cuspidata, 3–7·5 cm. longa, 1·5–3 cm. lata, juventute stellato-puberula, praesertim in nervis, demum glabra; petioli 1–1·5 cm. longi, juventute tomentelli, demum pubescentes. *Thyrsi* densi, 4–5 cm. longi, ubique fulvo-tomentelli; pedicelli circiter 3 mm. longi, vix 1 mm. infra apicem articulati. *Calyx* obconico-campanulatus, vix 5 mm. longus, extra tomentellus; tubus intus glaber; lobi irregulares, late ovati, usque ad 1 mm. longi, intus stellato-pubescentes. *Petala* spathulata, circiter 7 mm. longa. *Columna* staminalis 1·3–1·4 cm. longa.

Formosa. South Cape, *Henry* 1970.

805. **Impatiens Allanii,** *Hook. f.* [Geraniaceae-Balsamineae]; a speciebus aliis birmanicis petalis lateralibus pro floris magnitudine maximis differt.

Herba humilis, glaberrima, erecta, paucifoliata, grandiflora, caule gracili laxe ramoso, internodiis elongatis. *Folia* opposita, ovata, apice acuminata, minute serrulata, basem versus rotundatam cuneatamve ciliata, 3–5 cm. longa, submembranacea, laete viridia, subtus pallida, nervis lateralibus utrinque 5–6, petiolata; glandulae intrapetiolares deficientes. *Inflorescentiae* in axi primaria ramisque, pedunculatae, pauciflorae; pedicelli graciles, 1–2 cm. longi; bracteae lanceolatae, longe acuminatae, 3–4 mm. longae, membranaceae, persistentes?; flores ampli. *Sepala* duo lateralia lanceolata, longe acuminata, 8 mm. longa, membranacea, straminea, 3–nervia; sepalum posticum vexillare (vexillum) expansum, late trigonum, lateribus rotundatis in apicem acuminatum productis, 11 mm. longum et latum, aureum. *Petala* lateralia (alae) per paria in phyllum amplum bilobum

2·5–3 cm. longum et latum breviter stipitatum connata; lobus basalis minutus, varius, uncinatus, dilatatus vel deficiens; lobus distalis late dolabriformis vel semilunaris, apice acutus, pallide purpureus, basi stipiteque aureus; auricula dorsalis o; petalum anticum (labellum) lanceolatum, acuminatum, cymbiforme, 11 mm. longum, strictum, horizontale, lateribus involutis; calcar gracillimum, 3 cm. longum. *Filamenta* brevia, linearia; antherae didymae, obtusae, aureae. *Ovarium* ellipsoideo-oblongum, rectum, stigmatibus recurvis.

Burma. Henzada: S. Mayanaung Reserve; Kyibin Chaung, *C. W. Allan* (ex Hb. *Lace*).

This description, together with a drawing, was placed in the Herbarium by Sir Joseph Hooker in 1911 with a view to having it published in the Icones Plantarum. It is accompanied by the following note: "The remarkable species here figured was sent to me for the Kew Herbarium by my excellent correspondent, J. H. Lace, Esq., Chief of the Burmese Forest Dept. . . . I know of no species resembling it, and in the absence of fruit and seed it is impossible to determine its position in the Epitome of Burmese Balsams published in the Records of the Botanical Survey of India." The drawing will be incorporated in one of the next parts of the Icones Plantarum; but as it is desirable to have such a distinct species put on record, it is thought better not to delay the publication of the description any longer. The only material alteration made in Sir Joseph's original text concerns the use of certain terms for parts of the flower. This was deemed advisable in order to bring the description into line with the current conception of the Impatiens flower. At the same time, his terms have been retained in brackets, which will enable the student to correlate his terminology with that now accepted.

806. **Crataegus Lindenii,** *Stapf* [Rosaceae-Pomeae]; affinis *C. Rosei*, Eggl., sed foliis majoribus multo longius petiolatis supra magis pilosis haud glaucescentibus, inflorescentiis laxis, sepalis triangularibus brevioribus diversa.

Frutex vel arbor, inermis, ramis vetustis cortice cinereo tectis, hornotinis magis minusve laxe pilosis vel vegetis subglabris cortice castaneo. *Foliorum* lamina obovata, acuta, rarius apice rotundata, basi cuneata, interdum longe in petiolo decurrens, fere a basi argute inaequaliter dentata, incisuris hincinde profundioribus lobulos indicantibus, 2·5–6 cm. longa, 2–3 cm. lata, vix subcoriacea, supra laxe pilosa, infra ad costam villosula, ceterum ad nervos parcissime pilosa, siccando fuscescens, nervis utrinque 5 obliquis; petioli 5–10, vel in ramulis vegetis ad 2 cm., longi, laxe pilosi; stipulae haud visae, citissime caducae. *Corymbi* ad apices ramulorum foliigerorum 1·5–2·5 cm. longorum laxi, ad 2 cm. longi, ad 3 cm. diametro, pilis albis longiusculis laxe villosuli, pedunculo brevi vel nullo; bracteae subulatae, ad 3 mm. longae, tenues, parce glandulosae; pedicelli graciles, brevissimi vel ad 1 cm. longi. *Receptaculum* sub anthesi turbinato-campanulatum, 2·5 mm. altum, laxe villosulum. *Sepala* triangularia, acuta vel acuminata, ad 2 mm. longa, integra, raro hincinde denticulo addito, utrinque pilosula. *Petala* alba vel

rosea, rotundata, ad 5 mm. longa. *Stamina* circiter 10. *Styli* 5. *Fructus* ignotus.

Mexico. Chiapas; Ciudad Real (San Christoval), *Linden* 708.

807. **Begonia (Mitscherlichia) Rajah,** *Ridley* [Begoniaceae]; Gard. Chron. 1894, vol. xvi. p. 213, fig. 31 (nomen); Kew Bulletin, 1895, Appendix ii. p. 34 (nomen); a *B. goëgoensi*, N. E. Br., petiolis teretibus et hirsutis, foliis inaequaliter cordatis ciliatis subtus pilosis et insigniter purpureo-maculatis differt.

Herba acaulescens, nana. *Folia* radicalia, longe petiolata; limbus oblique cordato-orbicularis, breviter et abrupte acuminatus, crenulatus, interdum subangulatus, reticulato-venosus, 7–15 cm. longus, 6–15 cm. latus, viridis, insigniter brunneo-maculatus, supra nitidulus, bullatus, subtus pallidior, margine ciliatus; petioli suberecti, 8–25 cm. longi, pilosi; stipulae lanceolato-oblongae, subacutae, 1·5–2 cm. longae. *Pedunculi* suberecti, 20–25 cm. longi, pilosi, apice laxe cymosi. *Bracteae* ovatae, subacutae, 5–8 mm. longae, ut rachis roseo-suffusae. *Flores masculi* pedicellati, pedicellis gracilibus circiter 1 cm. longis. *Perianthii* segmenta 4, pallide rosea, 2 externa late obovato-orbicularia, obtusa, 1–1·2 cm. longa, 2 interiora anguste oblonga, obtusa. *Stamina* in toro convexo 1·5 mm. alto insidentia; filamenta brevissima; antherae obovato-oblongae, brevissimae. *Flores foeminei* graciliter pedicellati. *Perianthii* segmenta 3 vel 4, pallide rosea, quorum 2 exteriora late elliptico-ovata, obtusa, 6–7 mm. longa, caetera anguste oblonga et multo angustiora. *Ovarium* 3–loculare, 7–8 mm. longum, albidulum, roseo-marginatum, alis 4–5 mm. latis obtusis subaequalibus, placentis integris. *Styli* 3, basi breviter connati, 2–2·5 mm. longi, bifurcati, ramis in helicem sesquicyclicum tortis papillosis.

Malay Peninsula. Tringganu district.

This striking Begonia is a native of the Malay Peninsula, and was brought from the Tringganu district by a plant collector of the Singapore Botanic Gardens, where it flowered in 1892. It is mentioned in the Annual Report of the Singapore Botanic Garden for 1892 (page 3), as a very fine Begonia from Tringganu, but was not described. Plants were sent to Europe, and in August, 1894, it was exhibited at a meeting of the Royal Horticultural Society by Messrs. F. Sander and Co., St. Albans, and received a First-class Certificate. The plant on which this description is based is grown on the rockwork in the Nepenthes house at Kew.

R. A. R.

808. **Senecio Purdomii,** *Turrill* [Compositae-Senecionideae]: *S. nelumbifolio*, Bur. et Franch., affinis, sed capitulis paucioribus majoribus, involucri bracteis dense fulvo-puberulis differt.

Caulis erectus, teres, longitudinaliter sulcatus, dense fulvo-puberulus. *Folia* radicalia late orbicularia, apice rotundata, basi valde cordata, 3·3 dm. longa (petiolo excluso), 4·1 dm. lata, margine undulata et regulariter dentata, dentibus parvis, supra glabra subtus in nervis praecipue fulvo-puberula, palmatinervia, nervis principalibus 5–7 pagina inferiore valde prominentibus superiore leviter impressis, lateralibus reticulatis

subtus prominentibus supra inconspicuis vel leviter impressis, longe petiolata, petiolo 7 mm. diametro puberulo. *Inflorescentia* paniculata, ramis dense fulvo-puberulis majoribus longitudinaliter sulcatis. *Capitula* ambitu obconica, usque ad 1·7 cm. longa et 9 mm. diametro, eligulata, multiflora. *Involucri bracteae* uniseriatae, liberae, oblongo-lineares, apice acutae, 1·1 cm. longae, 3 mm. latae, margine membranaceae, extra fulvo-puberulae, intus glabrae. *Flores* omnes tubulosi, 1·5 cm. longi; pappus albus, 6 mm. longus, barbellatus; corollae tubus 8 mm. longus, parte inferiore 4 mm. longa cylindrica fere 1 mm. diametro, superiore gradatim ampliata, apice 2 mm. diametro; lobi 5, oblongo-lanceolati, 1·75 mm. longi, 0·5 mm. lati, acuti; filamenta gracilia, 4 mm. longa; stylus leviter exsertus, bifidus; achaenia immatura oblongo-cylindrica, 5 mm. alta, 1·5 mm. diametro.

North-West China. Exact locality unknown, *Purdom* 770. Cultivated and communicated by Messrs. J. Veitch and Sons.

2389 809. **Gentiana quinquenervia,** *Turrill* [Gentianaceae-Swertieae]; *G. macrophyllae*, Pallas, affinis sed foliis brevioribus angustioribus, corolla longiore late infundibuliformi differt.

Herba erecta, glabra, caulibus teretibus. *Folia* elliptico-lanceolata, acuta vel leviter acuminata, superiora basi connata, inferiora in vaginam tubulosam connata, usque ad 12·5 cm. longa et 3·6 cm. lata, glabra, margine angustissime membranaceo, nervis lateralibus utrinque 2 paullo supra basem exorientibus pagina superiore cum costa leviter impressis inferiore subprominentibus, costa subtus prominente. *Flores* 4–11, in foliorum superiorum axillis aggregati, sessiles. *Calyx* lateraliter profunde fissus, apice subtruncatus, tridentatus, dentibus 2–3 mm. longis inclusis 1·2 cm. longus, glaber. *Corolla* late infundibuliformis, 2·4 cm. longa; tubus 2 cm. longus, basi 1·5 mm., fauce 8 mm. diametro, glaber, intus superne maculis purpureo-viridibus ornatus, inferne albo-viridis, extra pallide virescens; lobi 5, late ovato-triangulares, apice subacuti, 5 mm. longi, 5 mm. lati, glabri, intus coerulei, extra virides, glabri; plicae apice bifidae, 3 mm. longae, 2 mm. latae, coeruleae. *Stamina* 5, filamentis decurrentibus, parte libera 4 mm. longa, antheris 2 mm. longis. *Ovarium* sessile, 1·2 cm. altum, 2 mm. diametro, glabrum, pallide viride; stigmata duo, 2 mm. longa.

North-West China. Collected by *Purdom*, exact locality unknown. Cultivated and communicated by Messrs. J. Veitch and Sons.

2389 810. **Plectranthus bifidocalyx,** *Dunn* [Labiatae-Ocimoideae]; *P. macrocalyci*, Dunn, affinis, sed calcaribus calyce longioribus et dentibus calycis acutis distinctus.

Herba praeter foliorum venas et calyces sparse et brevissime puberulos omnino glabra. *Folia* ovato-lanceolata, apice basique acuminata, ad 6 cm. longa, papyracea, breviter serrata, media superioraque subsessilia. *Paniculae* longae, angustae vel ramosae; cymae parvae, laxae, 1–1·5 cm. longae, contiguae, inferiores bracteis parvis suffultae. *Flores* 7–8 mm. longi; pedicelli

3–4 mm. longi, bracteolis minimis linearibus medio provisi. *Calyx* sub anthesi 2–3 mm., fructu 5–6 mm. longus, bilabiatus, labiis sacco corollae late extensis, superiore leviter trilobo fructu revoluto, inferiore altius bidentato fructu recto. *Corolla* coerulea; tubus cylindricus, 2 mm. latus, ima basi subito ad 1 mm. contractus, itaque saccatus; labia tubo bis breviora. *Stamina* inclusa.

China. Kiukiang; Lushan mountains, September 27th, 1891, *Bullock* 67.

811. **Scutellaria Wongkei,** *Dunn* [Labiatae-Stachydeae]; *S. scordifoliae*, Fisch., affinis, petiolis longis corollaeque tubo gracili distincta.

Herba erecta, ramosa, foliosa, 20 cm. alta, omnino praeter corollam dense puberula. *Folia* ovata vel ovato-lanceolata, 2–4 cm. longa, obtusa, basi truncata, chartacea; petioli $\frac{1}{4}$–$\frac{1}{3}$ laminae aequantes. *Racemi* in ramis brevibus terminales, 3–5 cm. longi, densiflori. *Flores* singuli, oppositi, 1·2–1·3 cm. longi; pedicelli 3 mm. longi; bracteae bracteolaeque minutae. *Calyx* 2 mm. longus. *Corolla* coerulea, anguste cylindrica, ima basi refracta, fauce expansa, bilabiata, 1·0–1·1 cm. longa, tubo 2–3 mm. lato; labium superius erectum, breviter galeatum, lateralibus lobis patentibus provisum; labium inferius late expansum lateribus deflexis. *Stamina* inclusa. *Nuculae* non visae.

China. Kwangtung: Sanning ("Shun-ling"); Sze-tse-shan, Aug. 1903, *Wong-ke* (Hongkong Herb. 899).

Sanning is on the sea coast south of Hongkong and Wongke was sent there by the writer, then Superintendent of the Botanical and Forestry Department in Hongkong, to make a botanical collection in 1903. He subsequently accompanied the Superintendent on numerous botanical explorations in the interior of China, and this species is named in acknowledgment of his valuable services as a collector on these occasions.

812. **Euphorbia sinensis,** *Jesson et Turrill* [Euphorbiaceae-Euphorbieae]; *E. pekinensi*, Rupr., affinis sed caulibus et foliis subtus tomentosis, bracteis longioribus facile distinguenda.

Caulis erectus, herbaceus, teres, tomentosus. *Folia* oblongo-linearia, apice acuta, basi abrupte angustata, usque ad 8·5 cm. longa et 1·1 cm. lata, margine integra, pagina superiore glabra, inferiore costa glabra exclusa tomentosa, costa utrinque prominente, nervis lateralibus supra subprominentibus subtus obscuris, sessilia. *Umbella* terminalis composita, 7 cm. diametro, radiis primariis 8 circiter 3 cm. longis; umbellae axillares 9–11, simplices, longe pedunculatae, pedunculis circiter 6 cm. longis; folia umbellarum terminalium foliis subsimilia sed minora et minus tomentosa; folia umbellarum secundarum et axillarium anguste ovata, apice acuta, base rotundata, 1·8 cm. longa, 9 mm. lata, utrinque glabra. *Involucrum* campanulatum, 3 mm. altum, 3 mm. diametro, glabrum; lobi 4–5, late semiorbiculares, apice rotundati, 1 mm. longi, 1·25 mm. lati, margine leviter crenulata, glabri, glandulis 4–5 latissime orbicularibus apice rotundatis integris glabris. *Ovarium* immaturum tuberculatum.

North-West China. Exact locality not known, *Purdom*. Described from a plant raised and communicated by Messrs. J. Veitch and Sons, July, 1914.

813. **Hippeastrum (Habranthus) Elwesii,** *C. H. Wright* [Amaryllidaceae-Amarylleae]; species *H. Ananucae,* Phil., affinis, perianthii segmentis luteis concoloribus, tubo intus sanguineo, staminibusque perianthio dimidio brevioribus differt.

Folia synanthia, linearia, acuminata, concava, 26 cm. longa, 5 mm. lata. *Pedunculus* cylindricus, 6 mm. diametro, biflorus; spathae 2, herbaceae, oblongae, concavae, acutae, 6 cm. longae, 8 mm. latae; pedicelli circiter 4 cm. longi, crassiusculi. *Perianthium* claro luteum, tubo intus sanguineo; tubus infundibuliformis, 1 cm. longus, basi 6 mm. diametro, squamis brevibus transversalibus supra filamentorum insertionem instructus; lobi subpatentes, elliptici, subacuti, 4 cm. longi, 1·8 cm. lati. *Stamina* perianthio dimidio breviora. *Ovarium* oblongum, 1·2 cm. longum, 7 mm. diametro, subcylindricum; stylus staminibus duplo longior; stigmatis rami breves.

Argentina. Described from a plant which flowered in September, 1903, and again in July, 1914, at Colesborne from bulbs introduced from Rio Limay, near Lake Nahuel-Huapi, Argentina, by Mr. H. J. Elwes.

The perianth-segments of this species are uniformly yellow, those of *H. Ananuca* are yellow with a red midrib.

814. **Eriocaulon Christopheri,** *Fyson* [Eriocaulaceae]; affinis *E. collino,* Hook. f., foliis rigidis crassis, corollae segmentis ♂ perlongis differt.

Caules caespitosi. *Folia* 2·5–3 cm. longa, circiter 9–nervia, supra canaliculata. *Vaginae* 2·5 cm. longae, ore bifido. *Scapi* pauci. *Capitula* 0·5–0·8 cm. diametro. *Involucri* bracteae exteriores brunneae, glabrae, interiores acuminatae, nigrae. *Receptaculum* villosum. *Bracteae* florales pilis crassis albis ciliatae. *Flores* ♂ : *Sepala* in spatham uno latere fissam connata, pilis albis robustis ciliata. *Corolla* tubulosa; tubus gracilis; lobi inaequales, perlongi, glandulis parvis et margine pilis albis longis instructi. *Antherae* nigrae. *Flores* ♀ : *Sepala* navicularia, nigra, in carina et margine parce pilosa. *Petala* oblanceolata, alba, pilis longis et glandulis parvis instructa.

South India. Nilgiris; Pykara, 2100 m., May, *Fyson* 2718.

A plant collected by Schmidt at Kaity mounted with others on a sheet marked "*E. trilobum*" in the cover of *E. collinum* in Herb. Kew is probably this species.

815. **Eriocaulon Geoffreyi,** *Fyson* [Eriocaulaceae]; species scapis solitariis, foliis rigidis saepe recurvatis distincta.

Folia linearia, acuta, saepe recurvata, 1·5–3 cm. longa, plana, circiter 9–nervia. *Vaginae* 1·6 cm. longae, ore bifido scarioso. *Scapi* solitarii, pergraciles, 5–12 cm. longi. *Capitula* alba, 0·6 cm. diametro. *Involucri* bracteae nigrae, glabrae. *Receptaculum* glabrum. *Bracteae* florales obovatae, cuspidatae, nigrae, superne dorso et margine albo-pilosae. *Flores* ♂ 3 mm. longi. *Sepala*

in spatham uno latere fissam connata. *Corolla* tubulosa; tubus gracilis, basin versus angustatus, superne ampliatus et cupularis; lobi subaequales, pilis crassis longis albis et glandulis magnis nigris instructi. *Antherae* nigrae. *Flores* ♀ : *Sepala* navicularia. *Petala* oblanceolata, fere ad basin pilis longis albis gracilibus instructa.

South India. Pulney Hills, on damp ground, 2300 m., *Fyson* 2085, 2165.

816. **Eriocaulon Mariae,** *Fyson* [Eriocaulaceae]; species habitu nana, foliis latis, perianthii segmentis ♀ partitis valde distincta.

Folia 1·5–2 cm. longa, 2–3 mm. lata, prominenter costata, glabra. *Vaginae* 1·5 cm. longae, acutissimae, apice leviter ampliatae. *Scapi* 5–8, 2·5–4 cm. longi, graciles. *Capitula* 3–4 mm. diametro. *Involucri* bracteae pallide brunneae, glabrae. *Bracteae* florales acutae, nigrae, pilis albis caespitosis instructae. *Receptaculum* longe et dense villosum. *Sepala* in spatham uno latere fissam connata. *Corolla* tubulosa; tubus et lobi parvi, glandulis magnis instructi. *Flores* ♀ 1·5 mm. longi. *Sepala* et *petala* fere ad basin in pilis gracilibus partita.

South India. Pulney Hills, in marsh above Kodaikanal, 2300 m., *Fyson* 2086.

817. **Eriocaulon mysorense,** *Fyson* [Eriocaulaceae]; affinis *E. Wightiano*, Mart., sed involucri bracteis glabris, bracteis floralibus nigris differt.

Rhizoma breve. *Folia* caespitosa, linearia, 10–20 cm. longa, 0·5—1 cm. lata, multinervia, tenuiter pilosa. *Vaginae* foliis paulo breviores, acutae, multicostatae, parce pilosae. *Scapi* 9–10, usque ad 45 cm. longi, prominenter costati, pilosi, apice subvillosi. *Capitula* nivea, circiter 1 cm. diametro. *Involucri* bracteae flavescentes, lanato-pubescentes. *Receptaculum* villosum. *Bracteae* florales acutae, superiores acuminatae, albo-pubescentes, perianthium superantes. *Flores* ♂ pallide brunnei. *Sepala* in spatham connata, dorso parce pilosa. *Petala* brevia, conspicue unguiculata. *Antherae* nigrae. *Flores* ♀ : *Sepala* oblanceolato-oblonga, plana, superne dorso pilis albis instructa. *Petala* libera, apice pubescentia, intra nigro-glandulosa.—*E. Wightianum*, Mart. in Wall. Pl. As. Rar. iii. 28, partim.

South India. Mysore, 1000 m., *Fyson* 1654; *Wall. Cat.* 6067 B "*E.? sexangulare*, Heyne;" Kurg, *Hooker and Thomson*, Madras Coll. 51; Concan, *Hooker and Thomson*.

818. **Eriocaulon Oliveri,** *Fyson* [Eriocaulaceae]: affinis *E. Geoffreyi*, Fyson, sed majus, involucri bracteis albis, perianthii segmentis masculis haud nigris differt.

Folia 1·5–2·5 cm. longa, acuta, 9-nervia, glabra. *Vaginae* 2–2·5 cm. longae, ore ampliato bifido. *Scapi* solitarii, pergraciles, 10–15 cm. longi. *Capitula* alba, 0·5–0·6 cm. diametro. *Involucri* bracteae albae. *Receptaculum* parce villosum. *Bracteae* florales pilis numerosis crassis albis instructi. *Flores* ♂ 2·5–3 mm. longi. *Sepala* in spatham connata, inferne pallida, superne fusca,

dorso pilis albis pilosa. *Corolla* tubulosa; tubus basin versus angustatus; lobi inaequales, pilis longis et glandulis magnis instructi. *Antherae* nigrae. *Flores* ♀ : *Sepala* nigra. *Petala* superne pilis crassis albis paucis, inferne pilis albis longis gracilibus instructa.

South India. Pulney Hills, 2300 m., *Fyson* 2994.

819. **Aneilema pulneyensis,** *Fyson* [Commelinaceae-Commelineae]; affinis *A. esculento*, Wall., sed radicibus longioribus non succulentis, floribus majoribus, petalis obtusioribus differt.

Radices elongatae, non succulentae; caules caespitosi vel ramosi, 10–20 cm. longi, basin versus foliis instructi, glabri. *Foliorum* vaginae 1 cm. longae; laminae 4·5–5·5 cm. longae, 0·6 cm. latae. *Flores* laxe paniculati, 0·6 cm. longi; bracteae persistentes, ovatae, 3 mm. longae. *Sepala* elliptica, 3–nervia. *Petala* obovata, unguiculata, basi connata. *Staminodia* alte trilobata. *Filamenta* barbata. *Ovarium* 3–loculare, ovulis in loculis uniseriatis. *Capsula* oblongo-obovoidea, 4–5 mm. longa. *Semina* in quoque loculo 5–6.

South India. Pulney Hills, 2300 m., *Fyson* 435; *Bourne* 144; *Wall. Cat.* 5208 C., "Herb Heyne."

This species is allied to *A. esculentum*, Wall., but may be separated from it by the differences noted above. In addition it may be mentioned that whilst the new species grows in the temperate region at 7000 feet and more, *A. esculentum* is found in the tropical climate of the South Indian plains.

820. **Agathis flavescens,** *Ridley* [Coniferae-Araucarieae]; species *A. regiae*, Warb., affinis, foliis obtusis haud lanceolatis acutis, squamis strobili angustioribus et ad basin trilobis, lobis incurvis acutis, amentis masculis quam iis ullius speciei minoribus, iis *A. regiae* exceptis distincta.

Arbor 40-pedalis vel minor, ramis patulis flavescentibus. *Folia* elliptica, basi angustata, obtusa, valde coriacea, flavescentia, 5–5·7 cm. longa, 1·3–2·5 cm. lata. *Amenta* mascula 3·6 cm. longa, 1·3 cm. crassa, cylindrica, obtusa, squamis antheriferis 3 mm. longis apice 4 mm. latis, limbo fere orbiculari, loculis paucis. *Strobilus* globosus, apice obtusus, 5·5 cm. longus, 4·5 cm. crassus. *Squamae* 3·1 cm. longae, 2·5 mm. latae, late obovatae, basi trilobae, lobis incurvis acutis, lobo mediano oblongo, limbo angusto vix 6 mm. lato. *Semen* ellipticum, utrinque rotundatum, complanatum, 1·2 cm. longum, 0·6 mm. latum, ala magna lata apice rotundata 1·2 cm. longa.

Malay Peninsula. Pahang; on the Padang of Gunong Tahan, 1530 m., *Ridley*.

This is a small species for the genus, only attaining a height of 40 feet with a diameter of trunk of 1 foot at the base on the open rocky plain at the top of Gunong Tahan. In the shadier woods it attains a greater height and here the leaves take on a green colour; on the exposed plain the whole plant is a curious yellow colour. It is quite distinct from *A. loranthifolia*, Salisb. (A. rhomboidalis, *Warb.*), the only other species in the Malay Peninsula, in its very small male spikes which are only comparable to those of *A. regia*, Warb., of Batchian.

LXI.—A NEW OIL-SEED FROM SOUTH AMERICA.

(Osteophloeum platyspermum, Warb.)

Enid M. Jesson.

At the present time, when vegetable fats are so largely in demand, the discovery of a seed yielding over fifty per cent. of fat, is likely to be of considerable commercial importance. The seed in question is that of *Osteophloeum platyspermum*, Warb. (Myristica platysperma, *Spruce*), a shipment of which was recently received at Liverpool; the tree is a native of North-West Brazil, where it was discovered by Spruce in 1852, in the forest near Panuré, on the river Uaupés, a tributary of the river Negro.

Several members of the *Myristicaceae* are already well known as yielding hard, usually yellowish fats, containing a large proportion of the glyceride of myristic acid, and the present representative is no exception to the rule—the fat obtained on extraction with petroleum ether being white and crystalline, and possessing a very slight smell. 55·2 per cent. of fat was obtained from the kernels of this sample, the analytical constants of which are given below:—

Melting point	43° C.
Solidifying point	39° C.
Saponification value	240·2 mmg.
Iodine value (Wijs)	6·3 per cent.
Refractive index at 40° C. (Zeiss Butyro-refractometer)	36·9

In addition to the above, the oil was found to possess 5·3 per cent. of free fatty acids (calculated as oleic acid).

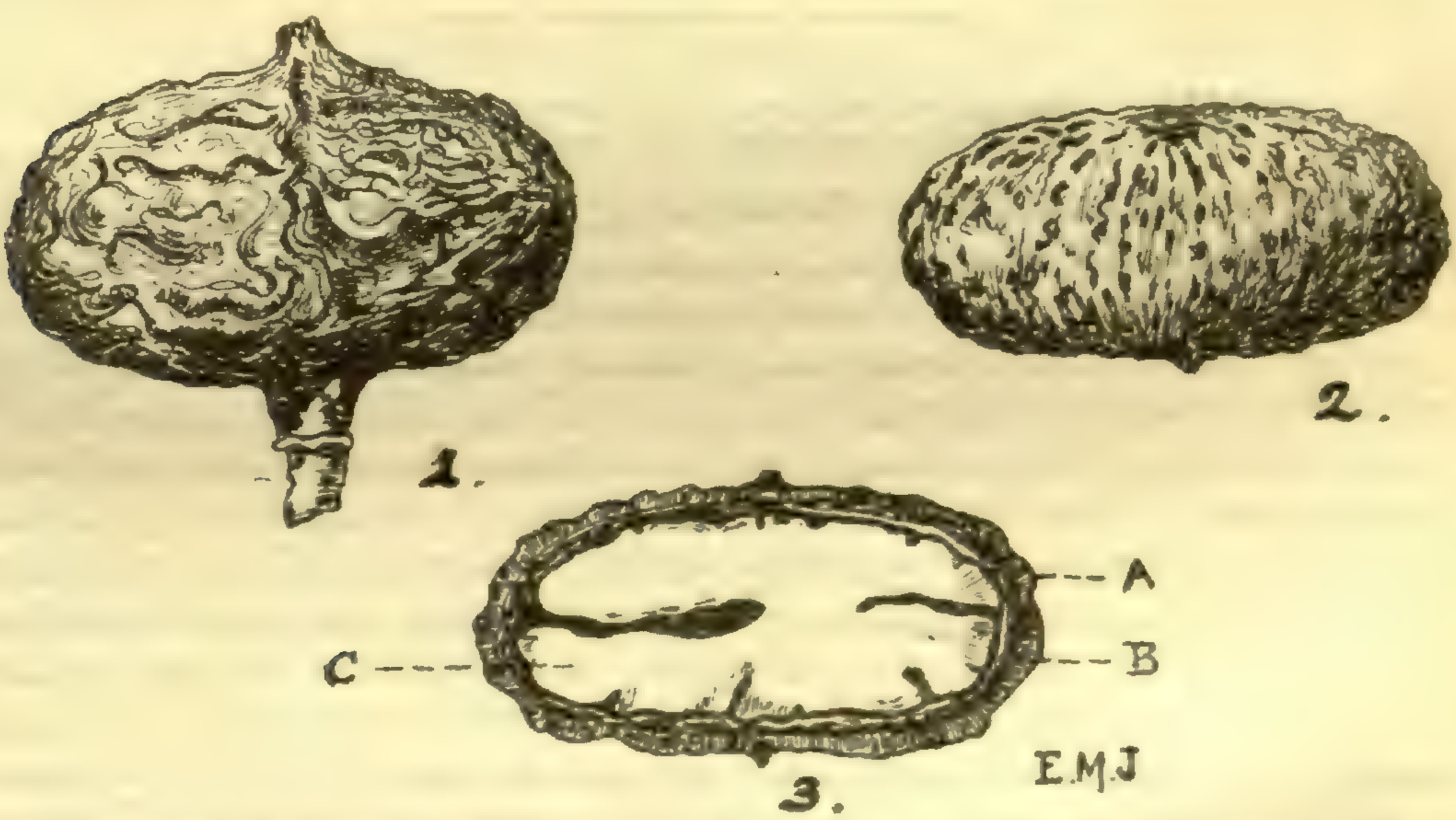


Fig. 1. Whole fruit showing pericarp. Fig. 2. Seed showing middle layer of testa. Fig. 3. Vertical section of seed, outer layer of testa removed. (A). Middle layer. (B). Inner layer. (C). Endosperm.
All figures × 1½.

The fruits are globose or elliptic, about 2½ cm. long and 1½ cm. high, and are either solitary or borne in small clusters on a short pedicel, the dehiscence taking place in the median plane, into

two valves. They consist of a pericarp, which is about 1 mm. thick, and in the dry state dark brown and very much wrinkled (fig. 1). This encloses the seed, the testa of which is made up of three layers, the outer, yellowish and more or less scaly may still be seen on some of the seeds, but in the majority of cases it has disappeared. The second layer is brown like the pericarp, firm and rugose in a somewhat radial manner, as shown in fig. 2; finally there is a thin brown skin (which is often decomposed to a resinous mass) covering the greenish-white endosperm, and in section the characteristic ramifications of this innermost layer of the testa into the endosperm may be seen (fig. 3). It has been stated above that the fat is white, and this may be attributed to the fact that these ingrowths are few in number, and therefore do not discolour the fat brown or black on extraction, as in the case of *Scyphocephalium Ochocoa*, or dark yellow as in several other species of *Myristica*, though in all these cases the endosperm itself is white. The aril, usually present in members of this family, is stated by Warburg to be complete or entire and not laciniate, but as no trace of it can be found in the present seeds, it is probable that it disintegrates early.

The specimens received from Liverpool had already been decorticated, that is the outer shell (pericarp) had been removed, while the remaining inner shell (middle testa) was found to be present in the same proportion as the kernel. In this connection it is important to note that this inner shell, though firm, is brittle, and would present little or no difficulty in crushing and separating.

It is not possible to say at present the quantity in which these seeds may be available for commercial purposes.

LXII.—DIAGNOSES AFRICANAE: LXI.

1521. **Lonchocarpus brachybotrys,** *Dunn* [Leguminosae-Dalbergieae]; *L. eriocalyci*, Harms, affinis, sed florum paniculis cum foliis fasciculatis et foliolis minoribus distinctus.

Arbor mediocris (5–10 m.), ramis patentibus primo dense velutinis tandem glabris rugosis. *Folia* 3–4-juga, 5–10 cm. longa, petiolo 3–4-plo longiora, rachi breviter velutina; stipulae persistentes, lineares, 3–5 mm. longae, tomentosae; foliola superiora lateralia oblanceolata, acuta, apiculata, 3–4 cm. longa, subcoriacea, supra tandem glabra, nitentia, subtus tomentosa, venis margini appropinquantibus 6–7-paribus haud prominentibus; petioluli 1–2 mm. longi; stipellae setaceae, 2–3 mm. longae. *Flores* in racemis brevibus vel paniculis pauciramosis cum foliis lateraliter fasciculatis; bracteae bracteolaeque lineares, minutae. *Calyx* 5–6 mm. longus, dense breviter lanatus; dentes aequales, triangulares, obtusi, tubo paullo breviores. *Petala* non visa. *Stamina* diadelpha. *Legumen* lineari-oblongum, utrinque rotundatum vel basi cuneatum, ad 7 cm. longum, 2 cm. latum, molliter pubescens; valvae inter semina cohaerentes, papyraceae.

Tropical Africa. French Congo: Shari basin; Senoussi Country, banks of Boro River, *Chevalier* 7771; 7772.

1522. **Ostryoderris Chevalieri,** *Dunn* [Leguminosae-Dalbergieae]; *O. gabonicae*, Dunn, affinis, foliolis numerosioribus exstipellatis distincta.

Arbor 12–20 m. alta, parte basali 5–8 m. longa nuda, 15–35 cm. diametro, cortice brunneo rugoso, gummum rubrum exsudente. *Folia* (vix matura tantum visa) imparipinnata, 6–7-juga, 30–40 cm. longa, petiolo 3–4-plo longiora; stipellae breves, lanceolatae; foliola lateralia superiora oblongo-lanceolata, ad apicem obtusum breviter angustata, basi subcordata, obliqua, 6 cm. longa, papyracea, utrinque sparse puberula; venae margini appropinquantes 7–8; petioluli 5 mm. longi; stipellae o. *Flores* in racemos praecoces 12–20 cm. longos vel rarius in paniculas pauciramosas infra folia enatas dispositi; rachis ut pedicelli, calyces, bracteae bracteolae foliaque juvenilia pube densa grisea vestita. *Flores* singuli, 1·5 cm. longi; pedicelli 5 mm. longi; bracteae bracteolaeque lanceolatae, persistentes. *Calyx* late campanulatus, dentibus brevibus late ovatis. *Petala* alba, siccitate nigrescentia, glabra; vexilli lamina suborbiculata, arcte reflexa, convexa, vix emarginata, basi rotundata, exappendiculata, ungui brevi lato; alae falcato-oblongae; carina alis aequilonga at latior, petalis navicularibus dorso apice carinatis basi breviter auriculatis. *Stamina* diadelpha, vexillare solutum. *Ovarium* subsessile, lineare, villosum, ovulis 6. *Legumen* 2-alatum, immaturum 10–12 cm. longum, 2 cm. latum, sparse sericeum, utrinque ala 3 mm. lata marginatum.

Tropical Africa. Senegal: Bundu; Loridji and Kontia abundant across the savannahs at the sources of the right affluents of the Gambia, *Chevalier* 26,047; Senegal, *Heudelot* 347. French Guinea; Siguiri, *Chevalier* 298. Sierra Leone; Falaba, *Scott Elliot* 5225.

This species has long been represented in a fragmentary form in the Kew herbarium, and the specimens which allowed a description to be drawn up were recently communicated by M. Chevalier. The following interesting field note accompanied the specimens: "Petit arbre de 12 m. á 20 m. de haut; tronc de 5 m. à 8 m. sans branches et de 15 cm. á 35 cm. de diamétre. Ecorce brune s'enlevant en plaquettes epaisses. Les feuilles tombent à la fin de la floraison. Fleurs blanches, se detáchant facilement et jonchant le sol en quantité au moment de la floraison. Nom. vern. Dianbalaka (Kassonkés du Sénégal). Intérieur du Sénégal: croit en assez grande abondance à travers les savanes incendiées annuellement de la province du Niani-Ouli et dans le sud du Bondou."

1523. **Euryops Dieterlenii,** *J. Medley Wood* [Compositae-Senecionideae]; species habitu alto, foliis latis, capitulis longe pedunculatis solitariis distincta.

Frutex ramosus, usque ad 2·5 m. altus, flores flavos conspicuos gerens; rami teretes, petiolorum delapsorum cicatricibus et basibus dense induti. *Folia* sessilia, alternata, ad ramulorum apices aggregata, anguste oblonga, utrinque attenuata, apice tridentata, 5–9 cm. longa, medio 1·2–2 cm. lata, margine integra, dentibus 2·5 mm. longis. *Capitula* multiflora, radiata; pedunculi foliis

longiores, apice incrassati. *Involucri* bracteae circiter 12, 2-seriatae, acutae, ad medium connatae, inferne cupulares. *Receptaculum* conicum, alte alveolatum. *Corolla* florum disci basi cylindrica, superne campanulata, 5-fida, dentibus acutis. *Stylus* bifidus, ramis brevibus crassis apice minute puberulis. *Achaenia* oblonga, 8-costata, glabra. *Pappi* setae numerosae, caducae.

South Africa. Natal: Amawahqua Mountain; near Bulwer, 1850–2150 m., April, *Haygarth in Herb. Wood* 12,601; Basutoland, *Dieterlen* 465.

Only one species of *Euryops* has been figured in my "Natal Plants," viz. *E. pedunculatus*, N.E. Br. (vol. iv. t. 363), a very different plant from the one here described. *E. Dieterlenii* is a much-branched undershrub which forms a rounded bush 4–6 feet in height. Specimens were first sent to the Natal Herbarium by Mrs. Dieterlen, who was then living at Leribé, Basutoland, and after whom the plant is named. Mrs. Dieterlen has collected extensively in Basutoland and has enriched the Natal Herbarium by the donation of some hundreds of duplicates. The same species was subsequently found by Mr. W. J. Haygarth, in moist and nearly inaccessible places on almost or quite perpendicular rocks on the sides of Amawahqua Mountain, near Bulwer, Natal. Only a few plants were found on the edge of the precipice and within reach of the collector. *E. Dieterlenii* is a taller plant with much broader leaves than any other species of the genus known to us.—J. M. W.

1524. **Anagallis bella,** *Scott* [Primulaceae-Lysimachieae]; ab *A. ruandensi*, Knuth et Mildbr., foliis oblanceolatis haud oppositis, corollae laciniis longioribus distincta.

Caulis gracilis, solo adpressus, nodis radicans, radicibus 2–7 cm. longis, viridis, usque ad 10 cm. longus, 1 mm. crassus, valde striatus, glaberrimus, internodiis brevissimis. *Folia* semper alterna, numerosa, plus minusve conferta, erecta, integra, oblanceolata, basi valde attenuata, apice subacuta vel obtusa, 1–1·2 cm. longa, 2 mm. lata, glaberrima, pagina utraque olivaceo-viridia, nervis obscuris, subsessilia vel petiolo usque ad 1 mm. longo suffulta. *Flores* axillares, magni, pedicellis sub anthesi 5–8 mm. longis erectis suffulta. *Calyx* fere ad basin divisus, glaber; segmenta lanceolata, 3 mm. longa, viridia, margine albido-viridia, persistentia. *Corolla* sicco pallide rosea, 1·5 cm. diametro, fere ad basin partita, tubo 1 mm. longo, lobis integris oblongis vel oblongo-spatulatis 8–9 mm. longis plus minusve patentibus. *Stamina* basi in tubum 1 mm. altum coalita, filamentis gracillimis glaberrimis 3 mm. longis, antheris parvis ellipsoideis vix 1 mm. longis. *Stylus* gracillimus, 4–5 mm. longus, stigmate parvo haud distincto. *Pyxidium* glabrum, globosum, stylo persistente coronatum, 4 mm. diametro, calyce cinctum, solo pedicello recurvato sepultum.

Tropical Africa. British East Africa; Aberdare Mountains, 3000 m., *Battiscombe* 833.

1525. **Phyllanthus Woodii,** *Hutchinson* [Euphorbiaceae-

Phyllantheae]; affinis *P. Dekindtii*, Hutchinson, sed habitu fruticoso pedicellis brevioribus, floribus ♀ paucis differt.

Caules suberecti, sublignosi, glabri; ramuli laterales floriferi numerosi, solitarii vel 2–3–nati, graciles, patuli, dense foliati, glabri. *Folia* ovato-elliptica vel oblongo-lanceolata, utrinque rotundata, 3–10 mm. longa, 2–4 mm. lata, glabra, infra glauca, nervis lateralibus 3–4 subconspicuis; petioli vix 0·5 mm. longi, glabri; stipulae subulatae vel subulato-filiformes, acutae, circiter 1 mm. longae, glabrae. *Flores* monoici, in ramulo quoque plerumque masculi, interdum paucis (1–2) feminei additis. *Flores* ♂ : pedicelli 1·5 mm. longi, glabri; sepala 5, late obovata, apice rotundata, 1·5 mm. longa, 1·25 mm. lata, membranacea, glabra; disci glandulae 5, rotundatae, planae, crasse verrucosae; stamina 3; filamenta ad apicem connata; antherae lateraliter dehiscentes. *Flores* ♀ : sepala 5, oblonga vel oblongo-elliptica, apice rotundata, circiter 1·5 mm. longa et 1 mm. lata, membranacea, glabra; discus leviter lobatus (fere annularis), planus, rubescens, glaber; ovarium laeve; styli 3, e basi divergentes, graciles, bilobati, apice non incrassati. *Capsula* depresso-globosa, leviter 6–lobata. *Semina* fere laevia.—*P. Niruri*, Drège, Zwei Pflanzengeogr. Docum. 151, non Linn.

South Africa. Natal; damp places near the Tugela River, *Gerrard and Macken* 1925; Clairmont, *Wood* 1765; near Pinetown, *Wood* 5303; Alexandra district; Farm Friedenau, *Rudatis* 317. Pondoland; Egossa, *Sim* 2515; Mengana Cutting, between Umtata and Port St. John's, *Bolus* 10,279; between St. John's River and Amsikaba River, *Drège* a; between Umtentu River and Umzimkulu River, *Drège* b.

1526. **Croton penduliflorus,** *Hutchinson* [Euphorbiaceae-Crotoneae]; affinis *C. Lehmbachii*, Hutchinson, sed foliis breviter acuminatis basi penninerviis, glandulis basalibus longe stipitatis, racemis longioribus floribus ♂ et ♀ intermixtis differt.

Ramuli leviter angulati, parce breviter puberuli vel glabri. *Folia* obovata vel obovato-elliptica, apice breviter acuminata, obtusa, basi subcuneata, 9–12 cm. longa, 5–6·5 cm. lata, crenato-dentata, membranacea, utrinque parce stellato-puberula, nervis lateralibus utrinque 5–7 arcuatis utrinque conspicuis, venis laxe anastomosantibus; glandulae basales annulares, stipitatae, stipite 2 mm. longo; petioli 3–4 cm. longi, subteretes, fere glabri. *Inflorescentia* bisexualis, terminalis, pendula, gracilis, usque ad 40 cm. longa, floribus ♂ numerosis femineis paucibus intermixtis; rachis prominenter sulcata, stellato-puberula; pedicelli graciles, ad 4 mm. longi, breviter pubescentes. *Flores* ♂ : sepala ovata, obtusa, 1·5 mm. longa, 1·25 mm. lata, parce stellato-pubescentia; petala obovata, apice rotundata, 2 mm. longa, 1 mm. lata, margine intra dense villosa, extra glabra; stamina circiter 12; filamenta filiformia; antherae 0·75 mm. longae; receptaculum albo-villosum. *Flores* ♀ : sepala oblongo-lanceolata, subacuta, 2 mm. longa, extra et apice pubescentia; petala nulla; ovarium tomentellum; styli basi liberi, bipartiti, recurvati.

Tropical Africa. Sierra Leone; Kennema, on the road to the station, May, *Aylmer* 138.

1527. **Antholyza speciosa,** *C. H. Wright* [Iridaceae-Ixieae]; *A. watsonioidi*, Baker, affinis, perianthii lobis ellipticis obtusis differt.

Cormus subglobosus, tunicis membranaceis reticulatis vestitus. *Caulis* erectus, validus. *Folia* ensiformia, acuminata, 9 dm. longa, 2–2·3 cm. lata; nervus centralis crassus. *Spica* ramosa, circa 1·5 m. alta; spathae herbaceae, virides, purpureo-tinctae, late lanceolatae, 6 cm. longae, 1·5 cm. latae. *Perianthium* roseum; tubus curvatus, 3 cm. longus, parte superiore 7 mm. diametro; lobi subaequales, elliptici, obtusi, 3 cm. longi, 1·5 cm. lati. *Stamina* perianthio breviora; antherae 1 cm. longae, obtusae, basi sagittatae. *Ovarium* oblongum, trilobatum; stylus filiformis, rami oblanceolati.

British East Africa. Aberdare Mountains, 3050 m. *Battiscombe* 838.

1528. **Dracaena sessiliflora,** *C. H. Wright* [Liliaceae-Dracaeneae]; species *D. surculosae*, Lindl., affinis, inflorescentia sessili floribusque haud pedicellatis differt.

Caulis teres, levis, annulatus. *Folia* subopposita, elliptica, utrinque attenuata, breviter petiolata, glabra, 15 cm. longa, 4 cm. lata. *Capitulum* terminale, multiflorum; bracteae ellipticae, obtusae, 7 mm. longae. *Calycis* tubus 2·6 cm. longus, gracilis, rectus; lobi oblongi, obtusi, 7 mm. longi, 2 mm. lati. *Stamina* exserta; filamenta 5 mm. longa; antherae oblongae, obtusae, 2·5 mm. longae. *Ovarium* ovoideum, obscure trisulcatum; stylus filiformis, staminibus, aequilongus; stigma punctiforme.

Tropical Africa. Sierra Leone; Heddle's Farm, common in undergrowth, *C. E. Lane-Poole* 155.

This species resembles *D. surculosa*, Lindl., which differs in having a lax inflorescence with slender peduncle and pedicels. The leaves appear to be whorled through the approximation of two decussate pairs.

1529. **Juncellus altus,** *Turrill* [Cyperaceae-Scirpoideae]; *J. pustulato*, C. B. Clarke, affinis, sed glumis longioribus angustioribus, nucibus biconvexis minoribus angustioribus distinguendus.

Culmi erecti, usque ad 9 dm. alti, inferne teretes vel subteretes, superne inconspicue trigoni, glabri, laeves, basi vaginis membranaceis glabris 8 mm. latis obtecti. *Folia* setacea, apice subacuta, usque ad 4·5 dm. longa et 1 mm. diametro, sulcata, glabra, laevia. *Inflorescentia* terminalis, radiis 2–5 usque ad 8 cm. longis vel spicis interdum fere sessilibus; bracteae 2–3, foliis similes, usque ad 2·2 dm. longae. *Spiculae* 4–9 aggregatae, ambitu elliptico-lanceolatae, 0·5–1·2 cm. longae, 3·5 mm. latae, multiflorae; rhachis compressa, 1 mm. lata, glabra. *Glumae* oblongo-ovatae, subobtusae, 3 mm. longae, 1·75 mm. latae, longitudinaliter nervosae, castaneo-brunneae, glabrae. *Stamina* 3, filamentis 3 mm. longis, antheris linearibus 1·75 mm. longis. *Ovarium* biconvexe ellipsoideum, 0·75 mm. altum, 0·4 mm. diametro, glabrum; stylus cum ramis duobus 0·75 mm. longis 2·2 mm. longus, glaber. *Nux* subaequaliter biconvexe ellipsoidea, 1·5 mm. alta, 1 mm. diametro, glabra, laevis, canescens.

Tropical Africa. Angola: Benguella; country of the Ganguellas and the Ambuellas, *Gossweiler*.

1530. **Pycreus pubescens,** *Turrill* [Cyperaceae-Scirpoideae]; *P. angulato,* Nees, affinis, sed culmis foliisque pubescentibus, nucibus minoribus truncatis differt.

Rhizoma breve, horizontale. *Culmi* erecti, usque ad 8·5 dm. alti, triangulares, sulcati, pubescentes, basi foliorum vaginis haud vel leviter fibrosis obtecti. *Folia* linearia, acuta, usque ad 3 dm. longa et 3 mm. lata, pagina superiore pubescentia, inferiore dense pubescentia. *Inflorescentia* composita, radiis circiter 4–5 usque ad 10·5 cm. longis 2–8-spiculatis; bracteae 2–3, foliis similes, inter se inaequales, usque ad 16 cm. longae. *Spiculae* ambitu elliptico-lanceolatae, multiflorae, 1–2 cm. longae, 3·5–6 mm. latae. *Glumae* anguste ovato-oblongae, acutae, circiter 5 mm. longae et 2·5 mm. latae, stramineae vel pallide brunneae, glabrae, laeves, deciduae. *Stamina* 2, filamentis usque ad 5 mm. longis, antheris anguste linearibus 2·2 mm. longis. *Ovarium* biconvexe obovoideum, lateraliter compressum, 1 mm. altum, 0·75 mm. diametro; stylus integer vel juventute cum ramis duobus 2·5 mm. longis 3·5 mm. longus. *Nux* biconvexe obovata, lateraliter compressa, truncata, 1·25 mm. alta, 1 mm. diametro, nigra, styli basi haud dilatata persistente.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 3920.

This plant possesses several remarkable characters which make it a very distinct species of *Pycreus*. Similar hairy leaves and stems are very uncommon in those *Cyperaceae* which have distichous glumes. The nuts are remarkably persistent on the rhachis, and the style too is subpersistent, though it finally breaks off, leaving its base attached to the middle of the truncate apex of the nut as a short apiculus. The two style arms fuse when the flowering period is over, and so in ripening nuts there appears to be an entire style.

LXIII.—THE ECONOMIC PROPERTIES OF SOME HARDY ORNAMENTAL FRUITS.

W. Dallimore.

During the present autumn numerous enquiries have been addressed to Kew regarding the domestic value of different kinds of ornamental fruits. The following notes have therefore been prepared in order to direct attention to some of the uses to which such fruits have been or are at present applied. It is doubtful, however, whether the thrifty housewife will consider the majority of those which are wholesome worth the trouble and expense which is necessary to make them palatable, for, when they are sufficiently plentiful to warrant the trouble of gathering, cultivated fruits of far superior quality are also usually abundant. Moreover, it is doubtful whether many of these fruits would survive the trial stage, for although our forefathers may have appreciated bletted service berries, mountain ash beer and candied barberies, modern taste prefers the more luscious fruits of the present day orchard.

Barbery.—The fruits of the common barbery (*Berberis vulgaris*, L.), are too acid to be eaten in the raw state, but they are sometimes made into jelly in the same way as red currants, the jelly being considered to possess a fine, pleasant, acid flavour. The fruits have also been candied and otherwise preserved with sugar and in an unripe condition they have been pickled in vinegar. Johnson and Sowerby "Useful Plants of Great Britain," refer to the fruits of the barbery being macerated in about 12 times their quantity of water, to which a little fennel seed has been added, and afterwards used as a cooling draught in cases of fever; whilst Bentley and Triman "Medicinal Plants," say that the ripe fruits are used in the preparation of cooling, astringent and antiscorbutic drinks which are given in febrile diseases and diarrhœa. It is probable that the fruits of all the species of *Berberis* can be used for similar purposes, for in North America those of *B. Aquifolium*, Pursh., are marketed for culinary purposes under the name of Oregon grapes; those of *B. aristata*, D C., and *B. Lycium*, Royle, are used in the Himalaya, and those of *B. asiatica*, Roxb., in the Himalaya and in China.

Spindle Tree.—The fruits of the spindle tree (*Euonymus europaeus*, L., are said to be poisonous and to have violent emetic and purgative properties, although the seeds are eaten by birds. A yellow dye has been obtained by boiling the seeds in water, and by mixing with alum a green dye may be procured. Johnson and Sowerby, l.c.

Holly.—*Ilex Aquifolium*, L., and other species of the genus produce fruits with violent purgative properties. They have practically no economic value but are eagerly eaten by birds during severe winters.

Buckthorn.—The juice of the ripe berries of the buckthorn of English hedgerows, *Rhamnus cathartica*, L., mixed with alum or lime furnishes the water-colour paint known as sap green, whilst dye is obtained from the fruits of *R. Frangula*, L., *R. infectoria*, L., and possibly from those of other kinds also. The **fruits** have violent purgative properties and must not be eaten.

Wild Cherry, Gean or Mazzard.—The wild cherry (*Prunus Avium*, L.), grows into a large tree and bears good crops of fruit in many parts of the country. The fruits are very acid and are usually overlooked by reason of the many kinds of cultivated cherries. They are, however, eagerly eaten by birds and have been employed in the manufacture of liqueurs. According to Loudon, "Arboretum et Fruticetum," Kirschwasser and Ratafia of Grenoble were prepared from the fruits about the middle of last century. Regarding the former he says: "The method of making the celebrated spirit is to take bruised cherries, in which the greater part of the kernels have also been broken, and to let them remain in a mass till the vinous fermentation is fairly established, after which the process of distillation is commenced and continued as long as the liquor comes over clear,

or till about a pint of liquor has been obtained from every 20 pints of fermented pulp. The kirschewasser comes from the still as clear as the purest water, and in order that it may not receive any tinge which would lessen its value, it is always kept in stone vessels or bottles." Alsace, Wurtemberg and Berne are given as the principal places of manufacture. The liqueur "Maraschino" was prepared from the fruit of *P. Marasca*, now included as a variety of *P. acida*, Borkh., in Dalmatia.

Bird Cherry.—The fruits of this tree, *Prunus Padus*, L., have a disagreeable flavour, but they are said to impart an agreeable flavour to brandy and home made wines, whilst in Sweden, Lapland, and some parts of Russia, a strong spirit has been prepared from the bruised and fermented fruit. According to Sargent, "Silva of N. America," the fruits of the American bird cherry (*P. virginiana*, L.), are used for a cordial by infusion in rum and brandy with sugar. The fruits of *P. serotina*, Ehrh., are used for a similar purpose.

Sloe or Blackthorn.—This plant (*Prunus spinosa*, L.), is common in English hedgerows and its black fruits are often produced in abundance. The fruits are too astringent to be pleasant, and although they are said to be eaten in some districts of the North of Europe, and with sugar to make a good preserve, they find little favour here. Their best known use is in the preparation of sloe gin; they have also been used for making a wine. The juice inspissated is said to form a nearly indelible ink.

Myrobalan or Cherry Plum (*Prunus cerasifera*, Ehrh.).—The fruits of this are used for preserves, puddings, pies and other culinary purposes. They have a pleasant acid taste and can also be used for dessert.

Peach (double-flowered).—The fruits of *Prunus Persica flore pleno* can be used for stewing or for preserving. For the latter purpose the stones should be removed. Some trees produce fruits with great regularity.

Common Laurel.—Birds are fond of the fruits of this bush (*Prunus Laurocerasus*, L.), but the flesh is too ill-flavoured for human food, moreover the plant contains prussic acid in its leaves and in the kernels of the fruits, therefore it is inadvisable to use the fruits for domestic purposes, although Loudon, l.c., refers to them as being sometimes used for puddings, and Miller, "Gardeners' Dictionary," says that the berries have been used for flavouring brandy and other spirits.

Almond (*Prunus Amygdalus*, Stokes.).—The greater number of almond trees found in gardens in the British Isles bear nuts with sweet kernels which are quite wholesome although they do not belong to the thin shelled variety *dulcis* which produces the dessert almonds of commerce. As an occasional tree may be found with bitter kernels, however, care should be taken in the use of the fruits, for the variety *amara*, with bitter kernels, contains

prussic acid and the consumption of a few kernels may result in serious consequences.

Crab Apple (*Pyrus Malus*, L.).—The fruits of the wild crab-apple are exceedingly sour and of little value, although Loudon, l.c., says that a drink called "boisson" was, in his day, made from them in France and England, and that a kind of vinegar known as "verjuice" was also made from them. The cultivated kinds of crab-apples, however, such as John Downie, Dartmouth and Transcendent, may all be used for jelly, whilst the Siberian crab, *P. baccata*, L., and the fruit of other exotic kinds can be used for the same purpose.

Mountain Ash or Rowan.—The red berries of this tree, *Pyrus Aucuparia*, Gaertn., are eagerly eaten by birds in spite of their extremely acid and rather bitter flavour. They have been used for jelly, but are not popular for the purpose. In Wales and in some European countries a strong spirit and a kind of beer have been made from them, whilst in some parts of the North of Europe the berries have been dried and ground into flour for bread making in times of scarcity. The fruits of the variety *rossica* are sweet and in the south of Russia they are preserved with sugar and sold as a sweetmeat. The berries of the variety *moravica* are larger and have a more pleasant taste than those of the type. They are used for culinary purposes in Moravia.

Service Tree.—The fruits of this tree, *Pyrus Sorbus*, Gaertn., were at one time used for dessert when in a condition approaching decay, as are medlars, but they have long since passed into disuse. Loudon refers to their use in Brittany in the manufacture of a very good cider or perry.

White Beam.—For almost all purposes the fruit of the white beam tree (*Pyrus Aria*, L.), can be used in a similar way to that of *P. Aucuparia*. It is, however, more pleasant to the taste and was at one time eaten when approaching a decayed condition. The fruit of the wild service (*P. Torminalis*, DC.), has been used for food when in a similar state.

Quince.—The fruit of the common quince, *Cydonia vulgaris*, Pers., is in frequent use as a flavouring agent and for making marmalade and jelly. The fruit of the two Japanese quinces, *C. japonica*, Thunb. and *C. Maulei*, T. Moore, are also used for jelly and other conserves. The fruit of *C. Maulei* has been specially recommended for the purpose.

Juneberry (*Amelanchier canadensis*) Medic. Although not in use in this country, the fruits of this tree are sometimes used for cakes and preserves in N. America.

Rose.—Fruits of various species of *Rosa* have been used for jellies and preserves, particularly large fruits like those borne by *R. rugosa*. The flesh is separated from the seeds and their attendant hairs, and preserved with sugar in the ordinary way. Rose jelly is considered to be a great delicacy in some countries.

Haws or Hawthorn Fruits.—The fruits of *Crataegus Oxyacantha*, L., are referred to by Johnson and Sowerby, l.c., as being seldom eaten here although very nutritious. They are said to be eaten largely in Kamtschatka and also to be made into a kind of wine by fermenting with water. The haws of several kinds of *Crataegus*, particularly those of *C. Azarolus*, L., and *C. tanacetifolia*, Pers., are apple-like in outline, nearly an inch in diameter and rather pleasant to the taste. They are sometimes used as dessert fruits.

Cotoneaster.—The fruits of most kinds of Cotoneaster are eagerly eaten by birds, but they do not appear to have been put to any domestic use.

Blackberries.—The fruits of various species of *Rubus* are known throughout the country as blackberries and they are the most useful of our wild fruits. The fruit of the wild raspberry, *R. Idaeus*, L., the cloudberry, *R. Chamaemorus*, L.; and stone bramble, *R. saxatilis*, L., are other British kinds which bear useful fruits. The fruits of many exotic kinds of *Rubus* may be used for similar purposes.

Elderberry.—*Sambucus nigra*, L., the common elder is a familiar shrub or small tree in most parts of the country. Its fruits are eagerly eaten by birds, but they are also gathered and made into a wine or syrup, which in a warm and sometimes spiced condition is frequently used in country places as a remedy for colds, in addition to being served as a beverage. The berries are said to have cooling, aperient, and diuretic properties, but to act as an emetic on some people. They have sometimes been used as a dye.

Guelder Rose (*Viburnum Opulus*, L.).—Loudon, l.c., refers to the fruit of this shrub being eaten in Sweden and also gives a reference to them being eaten in Siberia; elsewhere he says that they are bitter and nauseous. Neither the fruits of this species nor those of *V. Lantana*, L., have any use in this country, however, and are usually considered to be unwholesome though birds eat them greedily enough.

Honeysuckle or **Woodbine.**—The fruits of *Lonicera Periclymenum*, L., and other species have a disagreeable flavour and are credited with emetic properties, but they are usually eaten by birds as soon as they are ripe.

Tea Tree or **Box Thorn** (*Lycium chinense*, Mill.).—In this case the fruits are considered to be unwholesome, and to possess purgative properties. Other species are of no greater use.

Bitter Sweet (*Solanum Dulcamara*, L.)—The bright red berries of this trailing shrub have alternately a bitter and a sweet taste. They have poisonous properties and are of no value.

Strawberry Tree (*Arbutus Unedo*, L.).—The fruits of this plant do not appear to have been put to any regular use, though

Johnson and Sowerby, l.c., mention that they are collected and eaten by the peasantry in Ireland and L. H. Grindon in "Fruits and Fruit-trees," says that they are sometimes used in Spain and Corsica for the manufacture, by distillation, of a simple wine.

Bearberry (*Arctostaphylos Uva-ursi*, Spreng.).—This trailing shrub is found wild in the Highlands of Scotland and is common throughout the Northern Hemisphere. The berries do not appear to have been used for human food though they are eagerly eaten by grouse and other birds.

Bilberry, Blueberry, Whinberry, Hurtleberry, Whortleberry.—These names are applied to the fruit of a low-growing shrub, *Vaccinium Myrtillus*, L., widely distributed in the Northern Hemisphere and a native of the British Isles. The small blue-black berries are ripe in July and August and are used for pies, puddings, jams, jellies and other culinary purposes. They have also been used as a dye. The red fruits of another native species, *V. Vitis-idaea*, L., commonly called the cowberry, can be used in a similar manner and the fruits of exotic species are also edible.

Cranberries (*Oxycoccus macrocarpus*, Pers., and *O. palustris*, Pers.).—The first-named is a native of N. America and the other one is widely distributed through the Northern Hemisphere. The fruits of one or both species are sold by most fruiterers and are used for tarts and jelly.

Dogwood Berries.—Johnson and Sowerby, l.c., say that excellent oil adapted for domestic purposes, especially for burning in lamps, is obtained from the common dogwood, *Cornus sanguinea*, L., and Loudon, l.c., gives the yield of oil as 34 pounds of oil to 100 pounds of fruit. The latter also says that the fruits of the Cornel, *C. Mas*, L., were in his time used on the Continent for confectionery, marmalades, robs and liqueurs, also mixed with apples and pears for making cider; treated like green olives they formed a pickle and in a ripe state an oil was obtained from them. The fruits of *C. capitata*, Wall., are said to be eaten in the Himalaya, but they are not used in this country.

Sea Buckthorn (*Hippophae rhamnoides*, L.).—Although the berries of this shrub are very disagreeable to the taste they are referred to as follows by Johnson and Sowerby, l.c. "The Siberians and Tartars make a jelly from the berries, and eat them with milk and cheese, while the inhabitants of the shores of the Gulf of Bothnia prepare from them an agreeable rob, which they used as a condiment to their fish." An allied shrub, *Elaeagnus multiflora*, Thunb., bears orange-coloured fruits which are sometimes used for jam.

Bay (*Laurus nobilis*, L.).—Little use appears to have been made of the fruits of this tree although they were at one time considered to possess medicinal properties of astringent and carminative character.

Ivy.—The fruits of the ivy (*Hedera Helix*, L.), are said to possess purgative and emetic properties, but they are eagerly eaten by birds.

Mezereon.—The bright scarlet fruits of *Daphne Mezereum*, L., are of attractive appearance but are poisonous in character. A few berries have been known to result in the death of children who have inadvertently eaten them.

Privet.—From the fruits of *Ligustrum vulgare*, L., a rose-coloured dye has been obtained and according to Johnson and Sowerby, l.c., "they yield, when ripe, a good green dye to woollen cloth, previously dipped in a solution of alum, and the tint so imparted is more permanent than most vegetable greens."

Myrtilla (*Myrtus Ugni*, Hook. and Arn.).—The small sweet fruits of this shrub can be used for jam and jelly making. The fruit of the common myrtle (*Myrtus communis*, L.), has been used for similar purposes.

Yew.—Although nothing is to be gained by using the fruits of the yew (*Taxus baccata*, L.), the fleshy covering of the seed is not poisonous and is eagerly eaten by birds, and often by children.

Chile Pine or **Monkey Puzzle** (*Araucaria imbricata*, Pav.). The seeds of this tree are edible and are eaten regularly in Chile.

Stone Pine and **Swiss Stone Pine** (*Pinus Pinea*, L., and *P. Cembra*, L.). The kernels of the seeds of both these trees are used regularly for food by vegetarians and others in European countries.

LXIV.—MISCELLANEOUS NOTES.

Mr. J. C. Moore.—We learn that Mr. J. C. Moore, Agricultural Superintendent, St. Lucia (*K. B.*, 1895, p. 155), has been appointed Agricultural Superintendent, Grenada, in succession to Mr. G. G. Auchinleck, transferred to Mauritius (*K. B.*, 1914, p. 227).

Mr. S. C. Harland.—We learn that Mr. S. C. Harland, B.Sc., Assistant at the Agricultural Experiment Station, St. Croix, West Indies, has been appointed Assistant Agricultural Superintendent, St. Vincent, in succession to Mr. F. Birkinshaw, transferred to Mauritius (*K. B.*, 1914, p. 227).

Mr. A. B. Culham, a Curator in the Agricultural Department of the Southern Provinces of Nigeria (*K. B.*, 1910, p. 197), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Senior Curator in the Agricultural Department of the Gold Coast.

Mr. G. C. Johnson.—Mr. G. C. Johnson, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, a Sub-Inspector for the purposes of the Destructive Insects and Pests Acts under the Board of Agriculture and Fisheries.

The Giant Orchid.—The large plant of *Grammatophyllum speciosum* presented to Kew by Messrs. Sander and Sons, Bruges and St. Albans, in May, 1893, and since then one of the principal features of House No. 10, is again flowering. Owing to its having been found necessary to reduce the plant last year by removing the oldest pseudo-bulbs, it has on this occasion only one flower-spike, about 7 ft. in height, and carrying over fifty flowers and buds. A better idea of the capabilities of this remarkable orchid was obtained when the Kew specimen flowered in 1907. It then developed three racemes; the tallest attained nearly 11 ft. in height, and had, at one time, 82 expanded flowers and 40 unopened buds in various stages of development, the other two racemes being only slightly smaller. The largest flowers are commonly 6 ins. in diameter, and are borne on the lower half of the infloresence. The flowers have a spice-like odour and good lasting qualities. Their ground colour is dull yellow, heavily spotted with reddish brown; the sepals and petals are spreading, broadly oblong obtuse, undulate; the lip is small, being scarcely 1 in. long, three-lobed, orange streaked with red, the disk sulcate, with three raised plates, bristling with short hairs. The column is greenish-yellow spotted with reddish-brown. *G. speciosum* is the most common of the three or four species inhabiting the Malay Archipelago and Malacca. In a wild state, or cultivated in tropical gardens, it forms enormous masses on large trees, producing as many as fifty flower-spikes at one time. It was first flowered in this country in 1851. The Kew plant was one of the largest that could be found in the neighbourhood of Penang. It was originally intended for the Chicago Exposition, but, meeting with an accident during the voyage to England, it was decided not to send it any further.

W. W.

Botanical Magazine for November.—The plants figured are *Coelogyne brachyptera*, Reichb. f. (t. 8582); *Echinocactus minusculus*, Weber (t. 8583); *Nothofagus Cunninghamii*, Bl. (t. 8584); *Lonicera fragrantissima*, Lindl. et Paxt. (t. 8585); and *Primula vittata*, Bur. et Franch. (t. 8586).

The *Coelogyne* was described as long ago as 1881 by Reichenbach from material sent by Messrs. Hugh Low and Co., which had been imported from Burma, and considerable doubt was entertained as to its exact identity. The species was lost sight of from that time until the year 1910, when it was received with a small collection of orchids from Tenasserim, presented to Kew by Mr. H. Tilley, of Moulmein. It flowered at Kew in May, 1914. The flowers have a greenish-yellow lip with an

orange-coloured disc and show that *C. brachyptera* must be regarded as a distinct species from its nearest ally, *C. Parishii*, Hook, f.

Echinocactus minusculus, from Tucuman in Argentina, is one of the more interesting and easily cultivated of the small *Cactaceae*. It was introduced to cultivation about 1895. The flowers, as in *E. Fiebrigii*, Guerke, which are very numerous, are produced from the base instead of from the upper part of the plant, and this feature serves to distinguish these two species from others of the genus. The flowers have a crimson tube and vermilion petals and only remain open for a day or two.

The Southern "Beech" or "Myrtle Tree" of Tasmania is found on the mountains up to an altitude of 4000 ft., and is one of the main constituents of the evergreen forest. It is also found in south-eastern Australia. At Kew *Nothofagus Cunninghamii* is not hardy, but in the milder parts of the British Isles, notably, at Fota and at Osborne, there are fine specimens of this elegant tree. The tree at Fota is now nearly 50 ft. high and was probably planted half-a-century ago. Our illustration was taken from the small tree grown in the Temperate House at Kew, which is one of the plants presented to Kew by the late Mr. George Joad, of Wimbledon, in 1881. *N. Cunninghamii* is most nearly allied to *N. Menziesii*, Oerst., from New Zealand.

Lonicera fragrantissima has been in cultivation since 1845, when Fortune introduced it from Chinese gardens on behalf of the Royal Horticultural Society. In the wild state the plant is unknown. The well-known *L. Standishii*, Carr., is closely allied to our plant and the two species have sometimes been confused, the glabrous branches, elliptic or ovate-elliptic leaves, and externally glabrous corolla tube, distinguish *L. fragrantissima* from its ally.

The Chinese *Primula* was descibed from specimens collected in Szechuan, by Prince Henry of Orleans and Mr. Bonvalot, during their Chino-Tibetan journey. It is closely allied to *P. secundiflora*, Franchet, and like it has purple flowers, whereas the other members of the group, of which *P. sikkimensis*, Hook. f., is the best known, have yellow flowers. *P. vittata* can be distinguished from *P. secundiflora* by its erect, elongated leaves. We owe its first introduction to Mr. E. H. Wilson, who sent home seeds to Messrs. J. Veitch and Sons, in 1905, and subsequently, Mr. Forrest sent seeds to Messrs. Bees, Ltd. It was from one of the plants raised from Mr. Forrest's seeds that our plate has been prepared.

Bagolaro or Nettle Tree (*Celtis australis*, L.).—In the *Bulletin* for June, 1893, p. 145, appeared a brief reference to the application of the wood of this tree for making whip handles in the south of France, and in Bulletin No. 5, 1908, p. 230, is a further note on examples of rough and finished hay forks made on the Riviera from specially pollarded and trained trees of the same species. Specimens to illustrate both these industries are contained in

Case 109, Museum No. I. The tree is a native of the Mediterranean region, extending to Asia Minor and probably further eastwards in the Caucasus and Northern Persia. In France it is common in Provence and Languedoc, being cultivated as coppice. It has a straight trunk and branched head attaining 50 to 70 feet in height and a girth of 10 feet, but in rare cases becoming 20 feet in girth. The branches are long, slender and flexible, with a grey bark spotted with white and covered with a slight down at the extremities. The bark of the trunk is rich brown, in old trees covered with warty excrescences. The leaves are dark green, about 4 inches long and $1\frac{1}{4}$ inches broad, oval-lanceolate in shape, and are sometimes used for fodder. The flowers are of a greenish colour and inconspicuous. The fruit, which, when ripe, is blackish and resembles a very small withered wild cherry, is said not to become edible until the first frosts, and it hangs on until the following spring. It is remarkably sweet, and is considered by some writers to be the Lotus of the ancients. The berries are eaten in Spain and in Greece are known as Honey berries. The tree grows rapidly, more especially when once established and afterwards cut down, sometimes producing shoots six or eight feet in length. It is much used in the south of Italy and the south of France for planting squares and public walks. In a recently published Consular Report on the Agriculture and Industries of Piedmont, His Majesty's Consul gives the following particulars of the local interest in this tree.—The *bagolaro*, known in the United Kingdom under the name of nettle tree and Lote wood, grows naturally and plentifully in all the Alpine valleys of Piedmont, especially in the Stura Valley, where it is found on the mountain slopes as well as in the plain. It is also largely cultivated in the commune of Nole, particularly in that zone stretching along the left bank of the Stura River in the Lanzo Valley, and also, to a less extent, in the adjoining communes. The tree furnishes a compact, hard, heavy, and at the same time fibrous and elastic wood, practically unbreakable, a stick of which can be bent almost to a right angle without splitting. It is unaffected by inclement weather, very rarely attacked by woodworm and not liable to crack. For these qualities the stems or trunks are largely used for making whips, racquets, baskets, sticks, etc. It is said to be also adapted for carriage shafts and poles, chairs, etc. At Nole Canavese and neighbourhood, *bagolaro* is regularly cultivated as an industrial plant of considerable economic value, being grown on large tracts of land forming regular woods. When 10 or 12 years old, trees measure about 4 to 6 inches in diameter, but are never cut down until they reach at least $4\frac{3}{4}$ inches in diameter, this work being performed in winter.

The trunks thus obtained measure little less than 6 feet in length and weigh 55 to 77 lbs. avoir., the price being 16s. for ordinary trunks and £1 and £1 4s. for choice ones.

Whip making from *bagolaro* wood was introduced into Nole about the beginning of the last century by a certain Mr. Harley, and was continued and gradually improved by small local firms. At present it is carried out in regular factories employing some 300 workmen. Whips so made are exported into France, Spain,

Germany, Austria-Hungary, Belgium, North and South America, and even to Australia. They are sold at the following prices:—

	Price per dozen.						
	£	s.	d.		£	s.	d.
Common, plain	0	4	0	to	0	6	5
Better quality	0	5	7½		0	7	2½
Ornamented	1	0	0		1	4	0

J. M. H.

Arechavaleta, Las Gramineas Uruguayas.—This is a relatively scarce work, the systematic part of which appeared in the Anales del Museo Nacional de Montevideo, vol. i. (1894–1897). The latter was issued in six parts: part 1 consists of introduction and pages 1–78, and was printed by the firm of Dornaleche and Reyes; parts 2–6 were issued from the "Oriental" Press, and were printed in different type. The first instalment of Arechavaleta's memoir occupied pp. 29–78 of part 1, and was reprinted at the "Oriental" Press, apparently in order to have the whole of the memoir in the same type. This reprint was paged 29–92, and was issued without cover or title page. Part 2 of vol. i. continued the pagination of the reprint, and included pp. 93–212.

Arechavaleta's memoir contained numerous new species and combinations. Owing to the reprinting of the first instalment of it in larger type, those species which appeared in part 1 appeared on later pages of the reprint, and were taken up from the latter in *Index Kewensis*, Suppl. I. The index to vol. i. of the Anales also cites the pages of the reprint instead of those of part 1. The new names contained in parts 2 and 3 were quoted in *Index Kewensis*, Suppl. I. as appearing in volumes ii. and iii. of the Anales. Those included in parts 4–6 (1896–1897) were omitted from Suppl. II.

The following is a list of new species and new combinations contained in Las Gramineas Uruguayas. They will be inserted in *Index Kewensis*, Suppl. V.:—

Part 1 (1894).

Paspalum guenoarum, p. 50; reprint, p. 56.
,, *saltense*, p. 53; reprint, p. 59.
,, *uruguayense*, p. 54; reprint, p. 60.
,, *Larrañagai*, p. 60; reprint, p. 68.
,, *giganteum*, p. 62; reprint, p. 70.
,, *proliferum*, p. 63; reprint, p. 72.
,, *Arechavaletae*, p. 75; reprint, p. 86.
,, *enode*, p. 75; reprint, p. 87.
,, *dentatosulcatum*, p. 76; reprint, p. 88.

Part 2 (1894).

Anthaenantia Hackeli, p. 96; part 6, p. 555.
Panicum ramosum, p. 111.
,, *aequiglume*, p. 113.
,, *najadum*, p. 123.
,, *bambusoides*, p. 128; part 6, p. 555.
,, *Bergi*, p. 147.
Setaria caespitosa, p. 166.

Part 4 (1896).
Piptochaetum stipoides, p. 328.
,, *setosum*, p. 330.
Nassella trichotoma, p. 336.
Sporobolus subbulbosus, p. 343.
Agrostis pectinata, p. 347.
Danthonia cirrata, p. 367.
,, *montevidensis*, p. 369.

Part 5 (1896).
Spartina montevidensis, p. 378.
Chloris Canterai, p. 385.
,, *Berroi*, p. 388.
Pappophorum subbulbosum, p. 405.
Triodia Figueirai, p. 408.
,, *Hackeli*, p. 410.
Diplachne procumbens, p. 414.
Eragrostis trichocolea, p. 444.
,, *retinens*, p. 445.
Melica tenuis, p. 450.

Part 6 (1897).
Distichlis scoparia, p. 457.
Briza glomerata, p. 469.
Poa montevidensis, p. 479.
Bromus uruguayensis, p. 493.
Chusquea uruguayensis, p. 546.
Bambusa tacuara, p. 550.
Panicum Hackeli, p. 555.
Cenchrus scabridus, p. 556.

The following combinations, which were published as new by Arechavaleta, had already been made:—
Panicum nitidum, pp. 131, 556: *P. nitidum*, Lam.
Oplismenus compositus, pp. 160, 556: *O. compositus*, Beauv.
Pennisetum tristachyum, p. 219: *P. tristachyum*, Spreng.
,, *nervosum*, pp. 221, 556: *P. nervosum*, Trin.

M. L. G.

Agave sisalana and A. fourcroydes in Jamaica.—In a letter† read to the Board of Management of the Jamaica Agricultural Society on July 14th, 1914, the Hon. H. H. Cousins, Director of Agriculture, Jamaica, gives an interesting account of the growth of *Agave sisalana* on the limestone formation and of *A. fourcroydes*‡ on poor alluvial land deficient in lime, which should be studied by those interested in Sisal and Henequen. In British East Africa it would be possible to make a similar experiment in growing these two important fibre plants, and the experience gained in Jamaica is of great practical value:—

"I am desired by His Excellency to communicate to the Jamaica Agricultural Society the results of my recent observations as to

† See Journ. Jamaica Agric. Soc. xviii. August, 1914, No. 8, pp. 334-336.
‡ *A. fourcroydes*, Lemaire, *see* Trelease, Memoirs Nat. Acad. Sciences, xi. (1913), pp. 48, 49 t. 110-112. *A. rigida*, var. *elongata*, Kew Bull., 1892, p. 33.

*Agave fourcroydes** or Henequen and *Agave sisalana* or Sisal Hemp in Jamaica.

2. "The Departmental records show that one authenticated plant of Henequen was obtained from Kew in 1883 and planted at the Parade Garden. In 1886 the Colonial Secretary tried to secure a large consignment of Henequen plants from Yucatan through the British Consul at Progresso. The growers in Yucatan, however, refused to supply suckers, and the Consul was only able to send us 12 plants, which were set out at Hope Gardens.

"The Government of the Bahamas also at this time prohibited the export of suckers of the 'true Sisal' (*Agave sisalana*) so that Sir Henry Blake, who was very interested in this industry and desired to start it in Jamaica, was obliged to get suckers from the Caicos Islands. Some 23,000 of these were obtained and planted at Hope on an area of 30 acres now occupied by the Farm School. In 1891, 100,000 plants of *Agave sisalana* were obtained from Florida and distributed to the planters. The late Colonel Ward took most of these plants and set them out at Halse Hall, in Vere.

3. "The plants of *Agave sisalana* at Hope resulted in failure, as the plants poled at about two years and died before the leaves were fit for cutting. Owing to a marked fall in the price of Sisal Hemp fibre, Colonel Ward abandoned his enterprise and the industry was apparently quite dead by 1895.

4. "The recent success of Mr. Eric Anderson in the cultivation of *Agave sisalana* at the foot of the limestone hills above Morelands Estate, in Vere, has created a new interest in the Sisal Hemp industry. It is now demonstrated that the Sisalana will grow for several years without poling provided it be grown on its natural soil, which is that of a limestone formation.

"Mr. Anderson has also demonstrated that by cutting the leaves at three years instead of four years the plants are less liable to premature poling.

"There is a large supply of plants of *Agave sisalana* at present available in Jamaica, and it certainly merits the attention of planters who possess soils of limestone formation in the dry lowlands of the islands.

5. "My attention to the property of the Henequen (*Agave fourcroydes*) of not poling for a long time, even on a soil devoid of lime, was directed by the discovery by Mr. W. Harris, that a Henequen plant in the Parade Garden which poled in 1909 was apparently fourteen years old.

"The soil of the Parade Garden is a gravelly, alluvial deposit, very deficient in lime. Three plants of Henequen in the Cactus collection at Hope, which were set out in 1904 and are now ten years old, have not yet poled. It is, therefore, apparent that Henequen can be grown on dry, alluvial soils not of limestone formation without premature poling.

"There are large areas of dry, useless land in the Liguanea and St. Catherine plains that are at present almost useless for cultivation where Henequen should grow and yield profitable crops of fibre.

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* The spelling *fourcroydes* has been adopted instead of *fourcroides* in accordance with Trelease's Memoir.

6. "The two Henequen poles produced in the Parade Garden yielded about 7,000 plants, and these were presented to Hodges and Font Hill, in St. Elizabeth, and are now established on these properties. Mr. W. H. Griffiths, of Hodges, is extending his plantation of Henequen, and reports that the suckers supplied are growing well.

7. Mr. Stoddart, who wrote a bulletin on 'Sisal Hemp' for this Department in 1886, has recently rewritten this for the Journal of the Society, and holds a stock of about 100,000 plants of Henequen which are available to purchasers.

8. "In view of the interest and importance of the matter, I made an expedition recently into St. Catherine to investigate other possible sources of Henequen, and secured the services of Mr. W. Harris to assist me. We discovered Henequen plants growing freely along the main road near Old Harbour and saw many also growing in small holdings in this district, where they had been planted to make hedges.

9. "An interesting discovery was made when we called at the pen of Mr. Williams, near Old Harbour, where Henequen plants are a prominent feature of the frontage of the property.

"It was ascertained that a relative of this gentleman, named Ludford, about 60 years ago brought some Henequen plants to Jamaica from Yucatan and planted them on his property.

"Mr. Ludford must therefore be credited with the first introduction of *Agave fourcroydes* into Jamaica.

"When Colonel Ward was planting Sisal in Vere, I am informed he purchased poles of Henequen estimated to contain 20,000 bulbils from the stock introduced by Mr. Ludford for the sum of £5 per pole.

10. "We also discovered that Henequen growing near the residence of Mr. W. Watson, at Twickenham Park, near Spanish Town. Henequen has been planted on the limestone hills by the late Mr. A. Crum-Ewing, probably from suckers obtained from Hope Gardens. Mr. Watson has a very large run of land suitable for this culture and has decided to set out his plants of Henequen on an experimental plot of 5 acres.

11. "The Public Works Department has been requested by His Excellency to protect the Henequen plants now growing along the sides of the main roads in St. Catherine and to co-operate with us in securing the bulbils for planting when any of these plants pole.

12. "I believe that a large and lucrative industry can gradually be built up by the cultivation of Cauta Tree Cotton and Henequen on alluvial soils and of Cotton and true Sisal on the calcareous formations in dry and hot districts of the island.

"The special value of Henequen consists in its superiority for the purpose of making binder twine and the ever-growing demand for this material."

J. Hutchinson. del

A. Herderia truncata.
B. Triplotaxis stellulifera.

638 225, 595 : 50 12.14.

To face page 353.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10] [1914

LXV.—HERDERIA AND TRIPLOTAXIS.

J. Hutchinson.

(With Plate.)

The genus *Herderia* (*Compositae*), was founded by Cassini* in 1830 on a specimen collected in Senegambia, and preserved in the herbarium of M. Mèrat, Paris. The species, which he called *Herderia truncata*, is now known to be fairly widely spread in Tropical West Africa, occurring from the Senegal southward to Nigeria. A typical shoot of *H. truncata* is depicted on the plate, fig. A. The plant when mature is of a procumbent straggly habit with numerous weak branches radiating from an erect slender root, and the capitula are solitary at the ends of the leafy shoots. The involucre is very remarkable in the tribe *Vernonieae*, in that it consists only of two series of bracts, an outer one the bracts of which are foliaceous and free from one another (fig. 1 and 1a), and an inner row of membranous ones connate to above the middle (fig. 1). The achenes (fig. 2) are very strongly 4–ribbed and glabrous, and they support a pappus (figs. 3 and 4) arranged in two distinct series, a series of 9–10 small subpaleaceous scales with a series of 3–4 longer barbellate setae intermixed.

In 1849 a second speciés, *H. stellulifera*, was described by Bentham† from material collected by Vogel in the island of Fernando Po. A portion of a plant of this species is shown in the plate (fig. B). The capitula are arranged in lax corymbs and are supported on slender peduncles; the involucre is quite of the *Vernonia* character, *i.e.*, of about three series of bracts all quite free from one another and amongst themselves, and not at all foliaceous (fig. 6); the achenes (fig. 7) are terete and hairy, and the pappus is 1–seriate and represented by a very small pectinately toothed cup (fig. 8).

Comparison of habit and floral dissections, together with the widely different structure of the involucre, make it clear that the two species represent perfectly distinct genera.

* Cass. Dict. Sci. Nat. lx. 599.

† Benth. in Hook. Niger Flora, 425.

(3535.) Wt. 225-595. 1,125. 12/14. J. T. & S. G. 14.

Quite recently two additional species have been added to the genus, one of which, *H. lancifolia*, O. Hoffm.,* from the Belgian Congo, is undoubtedly congeneric with *H. truncata;* the other, *H. somalensis*, O. Hoffm.,† from Somaliland, having all the generic characters of *H. stellulifera*.

Hoffmann (Engl. l.c.) considered the differences in his Somaliland species to be insufficient for segregation as a separate genus from *Herderia truncata*. But his conclusions seem to have been based entirely on the distinctions of the pappus, and not on the structure of the involucres, which he appears to have overlooked. Consequently I have little diffidence in making *H. stellulifera*, Benth., and *H. somalensis*, O. Hoffm., the types of a new genus, for which the name *Triplotaxis* is proposed, in reference to the number of series of the involucral bracts. *Herderia*, as thus restricted, and the new genus are described in the following.

Herderia, *Cass.* Dict. Sci. Nat. lx. 599; DC. Prodr. v. 13; Benth. et Hook. f. Gen. Pl. ii. 232 (partim); O. Hoffm. in Engl. Pflanzenfam. iv. 5, p. 127 (partim).

Capitula homogama, tubuliflora. *Involucrum* campanulatum, e bracteis biseriatis constitutum, exterioribus foliaceis liberis, interioribus in tubum lobatum membranaceum connatis. *Receptaculum* concavum, nudum. *Corollae* aequales, regulares, tubo superne dilatato, limbo 5-lobato. *Styli* rami lineares, obtusi. *Achaenia* leviter obliqua, 4-angulata, apice truncata. *Pappi setae* circiter 5–9, breves, subpaleaceae, setis barbellatis 3–5 longioribus intermixtis—*Herbae* e basi ramosae, ramis plerumque plus minusve procumbentibus. *Folia* alterna, breviter petiolata, dentata vel integra. *Capitula* mediocria, solitaria, ramos foliatos terminantia. *Flores* rubri vel purpurei.

Species 2, Africae tropicae incolae.

Folia spatulato-obovata vel oblongo-oblanceolata, apice truncata vel rotundata, parce dentata, plerumque tenuiter pubescentia vel villosa; achaenia glabra	(1) *H. truncata.*
Folia lanceolata, acutissima, integra, glabra; achaenia pilosa	(2) *H. lancifolia.*

1. **H. truncata,** *Cass.* Dict. Sci. Nat. lx. 586 et 599; DC. Prodr. v. 13, includ. vars. *adscendens*, *multicaulis* et *leptorhiza;* Oliv. et Hiern in Oliv. Fl. Trop. Afr. iii. 298.

Ampherephis senegalensis, Less. in Linnaea vi. 687.

Herba e basi ramosa; rhizoma erectum, elongatum, gracile; caules numerosi, procumbentes vel ascendentes, subsimplices vel ramosi, plus minusve cano-pubescentes. *Folia* spatulato-obovata vel oblongo-oblanceolata, basi angustata, superne rotundata vel subtruncata, parce dentata, usque ad 4 cm. longa et 1·5 cm. lata, membranacea, plerumque tenuiter pubescentia, subtus glandulis numerosis instructa; nervi laterales utrinque 3–4, arcuati, vix conspicui. *Capitula* campanulata, circiter 6 mm. longa et diametro. *Involucri bracteae* exteriores foliaceae, oblanceolatae,

* Bull. Soc. Bot. Belg. xl. 22 (1901).

† Engl. Bot. Jahrb. xxxviii. 199, t. 1 (1906).

obtusae, 2·5–4 mm. longae, 1–1·5 mm. latae, virides, utrinque punctatae, interdum parce pubescentes; bracteae series interioris supra medium in tubum campanulatum connatae; tubus 1·5 mm. longus, extra parce puberulus; lobi oblongo-lanceolati, subacuti, 2 mm. longi, 1 mm. lati, extra longe pubescentes, ciliati. *Flores* rubri, circiter 20. *Corollae tubus* clavatus, basi cylindricus, superne ampliatus, 1·75 mm. longus; lobi triangulari-lanceolati, subacuti, extra glandulosi. *Antherae* basi sagittatae, 1 mm. longae, apice subacutae. *Styli rami* pubescentes. *Achaenia* 4 mm. longa, 1·25 mm. lata, prominenter 4–angulata, glabra. *Pappi setae* breviores 0·75 mm. longae, longiores 1·5 mm. longae, albae.

Senegambia: on the banks of the Senegal River, *Perrottet*! *Lelievre*! Sébi, *Chevalier* 1165! Gold Coast: Aburi (?), *Anderson* 28! banks of the Black Volta River, near Bjury, July, *Chipp* 506! Nigeria: Yola, in a marsh, May, *Dalziel* 37! Aboh, *Barter* 308!

var. **villosa,** *DC.* l.c. *Folia* pilis albis appressis densissime villosa.

Senegambia: without precise locality, *Perrottet*!

De Candolle's varieties, *leptorhiza*, *adscendens* and *multicaulis*, seem to me to be merely various stages of growth dependent on habitat.

2. **H. lancifolia,** *O. Hoffm.* apud Dur. et De Wild. in Bull. Soc. Bot. Belg. xl. 22 (1901).

Herbacea, annua, caule 0·5 m. alto sulcato glabro inferne simplice, superne in ramos paucos bracteatos monocephalos diviso folioso. *Folia* satis conferta, sessilia, lanceolata, acutissima, basi obtusa, intermedia usque ad 2 cm. longa et 4 mm. lata, inferiora et superiora minora, ramea bracteiformia remota, tantum sub capitulo crebriora, trinervia, glabra. *Capitula* multiflora, pedunculata, 7 mm. alta, 12 mm. diametro, pedunculis sub apice bracteis in squamas involucri transuentibus munitis. *Involucrum* latum, squamis [pluriseriatis?] lanceolatis acutis corollas aequantibus. *Corollae tubus* puberulus; lobi lineares, glabri. *Achaenia* pilosa. *Pappi paleae* biseriatae, paleis exterioribus 5 latis irregulariter dentatis, interioribus alternantibus aequilongis angustis lanceolatis acutis fere setiformibus.—Species pappo regulariter biseriale a typo generis nonnihil recedit.

Belgian Congo: Upper Marangu, Jan., *Debeerst* 87.

I have not seen an example of this species, but from Hoffmann's description, which is reproduced above with a few modifications for facility in comparison, I have no reason to doubt that the plant is a true *Herderia*.

Triplotaxis, *Hutchinson*, gen. nov., ob pappum cupularem pectinatum inter Vernonieas distinctissimum.

Capitula homogama, tubuliflora. Imvolucrum subcampanulatum, e bracteis triseriatis linearibus omnibus inter se liberis constitutum. *Receptaculum* planum, nudum. *Corollae* aequales, regulares, tubo superne sensim ampliato glanduloso, limbo 5–lobato. *Antherae* basi sagittatae. *Styli rami* lineares, obtusi, pilosi. *Achaenia* teretia, apice truncata, pilosa. *Pappus* cupu-

laris, pluripectinatim divisus.—*Herbae*, caulibus ramosissimis diffusis interdum decumbentibus. *Folia* petiolata vel sessilia, ovata vel linearia, crenata vel integra. *Capitula* parvula, in corymbos laxos foliis remotos disposita. *Flores* violacei.

Species 2, Africae tropicae incolae.

Folia petiolata, ovata vel ovato-lanceolata, crenulata ... ... (1) *T. stellulifera.*
Folia sessilia, linearia, integra ... ... (2) *T. somalensis.*

1. **T. stellulifera,** *Hutchinson*, comb. nov.

Herderia stellulifera, Benth. in Hook. Niger Flora, 425; Oliv. et Hiern in Oliv. Fl. Trop. Afr. iii. 298; Hiern in Cat. Afr. Pl. Welw. i. 540.

Caulis herbaceus, ramosissimus, diffusus, decumbens, crispo-puberulus. *Folia* petiolata, ovata vel ovato-lanceolata, basi breviter cuneata, apice acuta vel subacuta, 2–5·5 cm. longa, 1–3·5 cm. lata, crenulata vel subintegra, membranacea vel tenuiter chartacea, utrinque crispatim pubescentia vel supra fere glabra; nervi laterales utrinque 4–5, leviter arcuati, venis laxis vix conspicuis; petioli usque ad 1 cm. longi, pubescentes. *Corymbi* laxe ramosi, paucicephali; pedunculi graciles, ad 1 cm. longi, sulcati, breviter pubescentes. *Capitula* obconico-campanulata, circiter 3 mm. lata. *Involucri bracteae* triseriatae, extra pubescentes, series exterioris subulatae, acutae, 1 mm. longae, interioris anguste lanceolatae, ad 2·5 mm. longae, margine anguste membranaceae. *Corollae tubus* e basi sensim ampliatus, 1 mm. longus, parce glandulosus, inferne tenuiter pilosus; lobi triangulari-ovati. *Antherae* basi leviter sagittatae. *Achaenia* 1·5 mm. longa, parce pilosa. *Pappus* vix 1 mm. altus, multifidus.

Sierra Leone: *Welwitsch* 3519! open places in bush at Heddle's Farm, Dec., *Scott Elliot* 3933! Nigeria: Yoruba District; Ishagama, Mar., *Schlechter* 12309! Fernando Po: in open cultivated places, Mar., *Vogel* 265! *Barter*! Cameroons: Bipinde, *Zenker* 1279! Rio del Rey, *Johnston* 44! Gaboon: Munda district; Sibange Farm, *Soyaux* 331! Sierra del Crystal, July, *Mann* 1679! Belgian Congo: near Stanley Pool, Aug., *Hens* 20! Angola: Golungo Alto, *Welwitsch* 3515! 3516! Pungo Andongo, *Welwitsch* 3518! Niamniam: Assika River, May, *Schweinfurth* 3163!

2. **T. somalensis,** *Hutchinson*, comb. nov.

Herderia somalensis, O. Hoffm. in Engl. Bot. Jahrb. xxxviii. 200 cum ic. (1907).

Caulis fruticosus, ramosus, ramis divaricatis teretibus usque ad apicem foliosis tomentellis. *Folia* sessilia, linearia, acutissima, 1·5–5 cm. longa, 2–3·5 mm. lata, integra, chartacea, supra tenuiter villosa, demum fere glabra, infra persistenter incano-lanata; nervi haud conspicui. *Corymbi* paucicephali; pedunculi graciles, usque ad 2 cm. longi, pubescentes. *Capitula* subcampanulata, 6–7 mm. alta, 13–14 mm. diametro. *Involucri bracteae* circiter triseriatae, subulato-lanceolatae vel oblongo-lanceolatae, acutae, usque ad 6 mm. longae, extra pubescentes. *Corolla* violacea; tubus anguste cylindricus, 6–7 mm. longus, extra appresse pubescens; lobi lineares vel lineari-lanceolati, subacuti,

3·5 mm. longi, extra puberuli. *Antherae* apice breviter exsertae. *Achaenia* oblonga, leviter 5–gona, apice late truncata, pubescentia. *Pappus* cupularis vel subpatelliformis, pectinatim multodivisus.

Somaliland: Ogadén, Dec., *Riva* 19! between Dagage and Gobeli, May, *Ellenbeck* 1013!

Explanation of Plate.

A. Shoot of *Herderia truncata*, Cass.
Fig. 1, involucre of same, showing the 2 series of bracts, the inner connate.
,, 1a, one of the free outer foliaceous bracts.
,, 2, flower.
,, 3, longer seta of pappus.
,, 4, shorter seta of pappus.
,, 5, style.
B. Shoot of *Triplotaxis stellulifera*, Hutchinson.
Fig. 6, involucre of same.
,, 6a, three involucral bracts, one of each series.
,, 7, flower.
,, 8, part of pappus.
,, 9, base of achene.
,, 10, style.
Dissections variously enlarged.

LXVI.—FUNGI EXOTICI: XIX.

All the specimens described were collected by Mrs. Burkill in the Botanic Gardens, Singapore, and were accompanied by coloured drawings and notes prepared by the collector.

Agaricaceae.

Lepiota semivestita, *Massee*.

Pileus e conico-campanulato expansus, subumbonatus, centro squamuloso-squarrosus, marginem versus glabrescens, carneovinosus, expallens, 2 cm. latus. *Lamellae* confertae, albidae, liberae. *Stipes* aequalis, cavus, fibrillosus, carneolus, 4–5 cm. longus, 2 mm. crassus; annulus distans, membranaceus, persistens. *Sporae* obliquae, ellipticae, hyalinae, 5×3 μ.

Singapore. On the ground, *E. M. Burkill* 142, 143.

Allied to *Lepiota caryophylla*, Berk. & Broome, a Ceylon species.

Lepiota carneo-rubra, *Massee*.

Pileus carnosulus, e convexo-campanulato expansus, subgibbosus, squamulosus, carneo-ruber, marginem versus pallidior, 3–4 cm. latus. *Lamellae* liberae, confertae, candidae, postice annulato-conjunctae, angustae. *Stipes* aequalis, fistulosus, fibrillosus, pileo concolor, 6–7 cm. longus, 3–4 mm. crassus; annulus flocculosus, albido-carneus. Sporae ellipticae, hyalinae, 6×4 μ. Basidia clavata, 30×7—5 μ.

Singapore. On the ground, *E. M. Burkill* 136.

Allied to *Lepiota biornata*, Berk. & Broome.

Lepiota ochracea, *Massee.*

Pileus conico-companulatus, explanato-umbonatus, fibrillosus, ochraceus, 2 cm. latus. *Lamellae* confertae, albidae, postice liberae, *Stipes* aequalis, fistulosus, sericeus, pileo concolor, $3\frac{1}{8}4$ cm. longus, 1–1·5 mm. crassus; annulus inferus, persistens, membranaceus. *Sporae* ellipticae, hyalinae, 5×3 μ.

SINGAPORE. On the ground, *E. M. Burkill* 122.

Allied to *Lepiota adorea*, Berk & Broome, from Ceylon.

Lepiota ferruginosa, *Massee.*

Pileus carnosulo-membranaceus, e conico-campanulato expansus, umbonatus, striatus, squamulosus, ferruginosus, umbone obscuriore, 2–3 cm. latus. *Lamellae* confertae, angustae, albidae, liberae. *Stipes* aequalis, cavus, fibrillosus, pileo concolor vel dilutior, 4–6 cm. longus, 2–3 mm. crassus; annulus inferus, membranaceus, persistens. *Sporas* non vidi.

SINGAPORE. On the ground, *E. M. Burkill* 214.

Approaching *Lepiota fulvastra*, Berk. & Curt., but differing in the superior annulus and umbonate pileus.

Collybia altissima, *Massee.*

Pileus carnosulus, e convexo explanatus, subumbonatus, radiato-rugulosus. glaber, umbrinus, centro saturatior, 5 cm. latus. *Lamellae* subdistantes, latae, albae, postice adnexae. *Stipes* elongatus, sursum attenuatus, laevis, glaber, strictus, solidus, deorsum griseus, sursum albidus, 14 cm. longus, 3–4 mm. crassus. *Sporae* ellipsoideae, hyalinae, $7–8 \times 5$ μ.

SINGAPORE. On the ground, *E. M. Burkill* 112.

Allied to *Collybia radicata*, Fr., which differs in the rooting stem and different spores. *C. velutipes* is distinguished by its velvety stem.

Marasmius aratus, *Massee.*

Pileus membranaceus, convexo-hemisphericus, siccus, sulcato-striatus, rufo-purpureus, 2 cm. latus. *Lamellae* distantes, latae, postice rotundato-adnexae, carneo-tinctae. *Stipes* primo medullato-farctus, deinde fistulosus, aequalis, glaber, pileo concolor, 4 cm. longus, 1 mm. crassus. *Sporae* hyalinae, ellipsoidae, 5×3 μ.

SINGAPORE. On twigs, *E. M. Burkill* 113.

Most closely allied to *Marasmius sulciceps*, Berk., from Ceylon.

Marasmius papyraceus, *Massee.*

Pileus membranaceus, siccus, e convexo hemispherico-depressus vel umbilicatus, sulcatus, albidus, glaber, 3–4 cm. latus. *Lamellae* confertae, angustissimae, postice emarginato-uncinatae, albidae, acie integra. *Stipes* solidus, aequalis, deorsum brunneo-tinctus, sursum albidus. *Sporae* ellipsoideae, hyalinae, $8 \times 4–5$ μ.

SINGAPORE. Growing on wood, *E. M. Burkill* 121.

Growing in small clusters. Pileus very thin, dry and papery, coarsely sulcate.

Allied to *Marasmius hyperellus*, Fr.

Entoloma umbonatum, *Massee.*

Pileus membranaceus, e conico-campanulato subexpansus, umbonatus, fibrillosus, siccus, margine demum revoluto-fissus, 4–5 cm.

latus. *Lamellae* confertae, postice attenuato-adnexae, subventricosae, incarnatae. *Stipes* aequalis vel deorsum attenuatus, glaber, albidus, 4–5 cm. longus, 3 mm. crassus. *Sporae* ellipsoideae, 7×4 μ incarnato-tinctae.

SINGAPORE. On the ground, *E. M. Burkill* 61.

Allied to *Entoloma jubatum*, Fr., but distinguished by the grey pileus and whitish stem.

Flammula elegantula, *Massee.*

Pileus carnosulus, e convexo planus vel depressus, squamulosus, glabrescens, aurantio-brunneus, 4–5 cm. latus. *Lamellae* confertae, aurantiacae, postice attenuato-adnexae. *Stipes* aequalis, farctus, fibrillosus, pileo concolor, basi obscurior, 4 cm. longus, 3–4 mm. crassus. *Sporae* ellipsoideae, basi oblique apiculatae, 7×4 μ.

SINGAPORE. On the ground, *E. M. Burkill* 324.

A brightly coloured fungus belonging to the section of *Flammula* of which *F. sapinea* is the type.

Galera flexipes, *Massee.*

Pileus membranaceus, convexo-campanulatus, interdum subexpansus, pruinatus, glabrescens, sordide ochraceus, laevis, 1·5 cm. latus. *Lamellae* latae, subdistantes, acie fimbriata, laete ochraceae, postice rotundato-adnatae. *Stipes* flexuosus, primo fibrilloso-farctus deinde fistulosus, glaber, aequalis, pileo concolor, 4–5 cm. longus, 1 mm. crassus.

SINGAPORE. On the ground, *E. M. Burkill* 111.

Allied to *Galera stricta*, but smaller and with a slender, flexuous stem.

HYDNACEAE.

Hydnum elatum, *Massee.*

Pileus carnosus, e convexo depressus, margine sinuato lobatove, squamuloso-diffractus, ochraceo-incarnatus, marginem versus pallidior, 5–7 cm. latus. *Aculei* decurrentes, acuti, pallidi. *Stipes* solidus, subaequalis, pileo concolor vel pallidus, 10 cm. longus, 1 cm. crassus. *Caro* fibrosa, compacta, pallida.

SINGAPORE. On the ground, *E. M. Burkill* 183.

Remarkable for the long, stout stem. Allied to *Hydnum repandum*, Fr., which the present fungus approaches in colour. Probably edible.

LXVII.—LORANTHUS OLEAEFOLIUS.

T. A. SPRAGUE.

In 1810 J. C. Wendland proposed a new monotypic genus, *Lichtensteinia*, distinguished from *Loranthus* by connate filaments, and hence assigned by him to the Monadelphia Monogynia.* The type species, *Lichtensteinia oleaefolia*, Wendl., was a parasitic plant discovered in the Prieska Division of Cape Colony by Dr. H. Lichtenstein, who travelled in South Africa during the period 1803-1806. Lichtenstein gave the following account of the species to Wendland:

* Coll. Pl., vol. ii., pp. 4–7, t. 39 (1810).

"I found this parasitic plant in June, 1805, by the Orange River at the ford which the Carana Hottentots call Pristkap.* It grew here and there on different species of *Lycium*, and also, but less frequently, on the highest branches of *Mimosa nilotica* [*Acacia horrida*, Willd.]. Its root is woody and tuberous, always much thicker than the branch on which it grows, and which it not unfrequently surrounds, as our *Viscum* does. The branchlets are woody up to the apex, with grey bark and white wood. The largest plant had a length of a foot and a half. It was just beginning to flower, but nevertheless on my return five weeks later not a trace of fructification was to be found. The old flowers, however, were split down longitudinally and bent back. Apart from the beauty of its flowers and the strangeness of its structure, the whole growth attracted my attention all the more because it was, on account of the cold season, almost the only plant in this region which I met with in full flower."

The chief interest of the above account lies in the long period during which the corolla of this species persists. Very little is known about the duration of the corolla in the *Loranthaceae*. The petals of *Viscum nervosum*, Thunb., are persitent in fruit,† and those of *Loranthus undulatus*, E. Meyer, appear to remain on the ovary for a considerable period after fertilisation has taken place, judging from herbarium specimens.

Acording to Lichtenstein,‡ Willdenow reduced *Lichtensteinia*, Wendl., to *Loranthus*, but the reduction was never published. Chamisso and Schlechtendal mention, however, that *Lichtensteinia oleaefolia* is represented in Willdenow's herbarium under the name *Loranthus Lichtensteinii*.§

F. G. Dietrich reduced *Lichtensteinia* to *Loranthus* in 1818, and re-named the species *Loranthus speciosus*.‖ In 1828 Chamisso and Schlechtendal accepted the reduction, and proposed the new combination *Loranthus oleaefolius*, which preserves the original specific name.§ They described a new species, *Loranthus elegans*, which had been collected at Caledons-kluft by Mund. This was said to resemble *L. oleaefolius* in habit; it differed in the glabrous corolla with spirally revolute lobes and the longer, linear anthers.

In 1830 J. A. and J. H. Schultes proposed the new name *Loranthus Schlechtendalianus* to replace *L. elegans*, Cham. & Schlecht., on account of the latter being antedated by *L. elegans*, Mart.¶ Two years previously Anton Sprengel had founded a new genus and species of *Lobeliaceae*, *Moquinia rubra*, on Zeyher's n. 296 from Uitenhage. *Moquinia* was transferred to the *Loranthaceae* by Griesselich,** and *M. rubra* was reduced to *Loranthus Schlechtendalianus* by J. A. and J. H. Schultes.¶

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* The spelling Priskob is given by Lichtenstein, Travels in S. Africa, Engl. ed., p. 340 (1812).

† Sprague in Dyer, Fl. Trop. Afr., vol. vi., sect. 1, p. 394 (1911).

‡ Travels in S. Africa, p. 221 (1812), footnote.

§ Linnaea, vol. iii., p. 209 (1828).

‖ Lexik. Gaertn. Nachtr., vol. iv., p. 473 (1818).

¶ Schultes, Syst. Veg., vol. vii., p. 1635 (1830).

† Tent. Suppl. Syst. Veg., p. 9 (1828).

** Linnaea, vol. v., p. 421 (1830).

In 1837 Ecklon and Zeyher enumerated as *Loranthus oleaefolius* a plant collected by them in the Clanwilliam Division.*

E. Meyer recorded *L. oleaefolius* from Little Namaqualand in 1843†; and proposed (without describing) a new species, *L. croceus*, based on specimens collected by Drège in the Clanwilliam, Prince Albert and Albany Divisions.‡

In the following year Presl reduced both *L. elegans*, Cham. & Schlecht., and *L. croceus* to *L. oleaefolius*, apparently relying on Ecklon and Zeyher's identification of the latter; he stated that the specimens which Drège had issued as *L. oleaefolius* probably represented a new species, which might be called *L. Meyeri*.§

In 1847 Drège‖ reduced *L. croceus* to *L. elegans*, Cham. & Schlecht., and also referred to the latter the Clanwilliam specimens which Ecklon and Zeyher* had enumerated as *L. oleaefolius*. According to Drège, therefore, the synonymy and distribution of *L. oleaefolius* and *L. elegans* were as follows:—

1. **Loranthus oleaefolius,** *Cham. & Schlecht.—Lichtensteinia oleaefolia*, Wendl. *Loranthus speciosus*, Dietr. *L. Lichtensteinii*, Herb. Willd.

Distrib. Prieska Division, *Lichtenstein*; Little Namaqualand, *Drège*.

2. **Loranthus elegans,** *Cham. & Schlecht.—L. croceus*, E. Meyer. *L. oleaefolius*, Eckl. & Zeyh., non Cham. & Schlecht.

Distrib. Caledons-kluft, *Mund*; Clanwilliam Div., *Ecklon & Zeyher, Drège*; Prince Albert Div., *Drège*; Albany Div., *Drège*.

In 1862, however, Harvey accepted Ecklon and Zeyher's identification of their Clanwilliam plant as *L. oleaefolius*, and founded a new species, *L. namaquensis*, on the Little Namaqualand specimens referred by E. Meyer and Drège to *L. oleaefolius*.¶ According to Harvey, the synonymy of the two species was as follows:—

1. **Loranthus namaquensis,** *Harv.—L. oleaefolius*, E. Meyer, non Cham. & Schlecht.

2. **Loranthus oleaefolius,** *Cham. & Schlecht.—Lichtensteinia oleaefolia*, Wendl. *Loranthus Lichtensteinii*, Herb. Willd. *L. elegans*, Cham. & Schlecht. *L. croceus*, E. Meyer.

Harvey's delimitation of the two species is the same as Drège's: the only point at issue is the incidence of the name *Lichtensteinia oleaefolia*, Wendl., and its synonyms. Harvey divided the South African species of *Loranthus* into two groups, the first including those with the unopened corolla cylindric or clavate, not swollen at the base nor constricted, the second comprising those with the unopened corolla strongly constricted above the urceolate or swollen base. He placed *L. oleaefolius* in the former group,

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* Enum., p. 358 (1837).
† Drège, Zwei Pfl. Docum., pp. 92 (III. B. 8), 96 (III. C. 6).
‡ Drège, l.c. 63 (II. D. 8), 139 (V. A. 39), 109 (III. E., a. 9).
§ Bot. Bemerk., pp. 75, 76 (1844).
‖ Linnaea, vol. xix., p. 663 (1847).
¶ Harv. & Sond. Fl. Cap., vol. ii., pp. 575, 576 (1862).

whereas it is clear from the figure of *Lichtensteinia oleaefolia*—which he cannot have seen—that it belongs to the latter. There can be no doubt that it is conspecific with *L. namaquensis*, Harv. Apart from the style, which is represented as filiform instead of skittle-shaped, the figure of *Lichtensteinia oleaefolia* agrees with *Loranthus namaquensis*: the shape and indumentum of the corolla, the shape and size of the corolla-lobes and anthers, and the union of the filaments definitely preclude identification with *L. elegans*. The indumentum of the corolla of *Lichtensteinia oleaefolia* (fig. *e*) agrees with Burchell's n. 1468, from the Prieska Division. The synonymy and distribution of the two species may now be stated as follows:

1. **Loranthus oleaefolius,** *Cham. & Schlecht.* in Linnacea, vol. iii. p. 209 (1828); DC. Prodr. vol. iv. p. 304; Schultes, Syst. Veg. vol. vii. p. 1634; E. Meyer in Drège, Zwei Pfl. Docum. pp. 92 (III. B. 8), 96 (III. C. 6). *Lichtensteinia oleaefolia*, Wendl. Coll. Pl. vol. ii. p. 4, t. 39 (1810). *Loranthus speciosus*, F. G. Dietr. Lexik. Gaertn. Nachtr. vol. iv. p. 473 (1818). *L. Lichtensteinii*, Herb. Willd. ex. Cham. & Schlecht. in Linnaea, vol. iii. p. 209 (1828), in syn. *L. Meyeri*, Presl. Bot. Bemerk. p. 76 (1844), nomen. *L. namaquensis*, Harv. in Harv. & Sond. Fl. Cap. vol. ii. p. 577 (1862); Sprague in Dyer, Fl. Trop. Afr. vol. vi. sect. 1, p. 361. *L. bumbensis*, Hiern in Cat. Afr. Pl. Welw. vol. i. p. 933 (1900). *Tapinanthus namaquensis*, Van Tiegh. in Bull. Soc. Bot. France, vol. xlii. p. 267 (1895).

Distrib. Angola, German South-West Africa, Rhodesia, Bechuanaland, Ngamiland, Little Namaqualand, Little Bushmanland, Prieska Division, Transvaal.

2. **Loranthus elegans,** *Cham. & Schlecht* in Linnaea, vol. iii. p. 209 (1828); Drège in Linnaea, vol. xix. p. 663. *Moquinia rubra*, A. Sprengel, Tent. Suppl. Syst. Veg. p. 9 (1828); Griesselich in Linnaea, vol. v. p. 421. *Loranthus Schlechtendalianus*, Schultes, Syst. Veg. vol. vii. p. 1635 (1830). *L. croceus*, E. Meyer in Drège, Zwei Pfl. Docum. p. 200 (1843), nomen. *L. glaucus*, DC. Prodr. vol. iv. p. 303, non Thunb. *L. glaucus*, var. *Burchellii*, DC. l.c. (1830). *L. oleaefolius*, Eckl. & Zeyh. Enum. p. 358; Harv. in Harv. & Sond. Fl. Cap. vol. ii. p. 576; Benth. & Hook. f. Gen. Pl. vol. iii. p. 209; Engl. in Engl. Jahrb. vol. xx. p. 83; Engl. & Prantl, Nat. Pflanzenfam. vol. iii. 1, p. 187, t. 126, fig. L—N; non Cham. & Schlecht. *L. oleifolius*, Marloth, Fl. S. Afr. vol. i. p. 167, t. 38, fig. A. *L. speciosus*, Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. i. p. 131, non F. G. Dietr. *Lichtensteinia elegans*, Van Tiegh. in Bull. Soc. Bot. France, vol. xlii. p. 254 (1895). *L. speciosa*, Van Tiegh., l.c.

Distrib. Cape Colony: Divisions of Clanwilliam, Worcester, Prince Albert, Murraysburg, Graaff Reinet, Somerset, Queenstown, Cathcart, Komgha, Albany, Alexandria, Uitenhage.

THE SECTIONS OF LORANTHUS.

The erroneous identification of *Lichtensteinia oleaefolia* with *Loranthus elegans* has led to the generic and serial names *Lichten-*

steinia and *Oleaefolii* being misapplied to the group of which *L. elegans* is the sole representative. For this group the sectional name *Moquinia* is now suggested.

The nomenclature of the subordinate groups within the genus *Loranthus* is in a rather confused state, owing to the very different divisions proposed by various authors.

In February, 1830, Martius segregated five genera from *Loranthus*: *Struthanthus*, *Psittacanthus*, *Tristerix*, *Dendrophthöe* and *Phthirusa*.* Of these, the purely American genera *Struthanthus*, *Psittacanthus* and *Phthirusa* are still recognized, whilst *Dendrophthöe* has been re-united with *Loranthus*. *Tristerix* was based on *Loranthus viridiflorus*, Wall. (Nepal), *L. tetrandus*, Ruiz & Pav. (Chile) and *L. Reinwardtianus*, Schultes (Java), which are now referred respectively to the genera *Elytranthe*, *Phrygilanthus* and *Loxanthera*.†

In 1829 Blume prepared the *Loranthaceae* of his Flora Javae,‡ and divided *Loranthus* into seventeen genera. He sent a synopsis of these to J. A. and J. H. Schultes, who published it in their Systema Vegetabilium, vol. vii. p. 1729 (1830). In the Flora Javae itself, of which the part containing *Loranthaceae* did not appear until after February, 1830,§ Blume assigned only sectional rank to his segregates. Blume's seventeen genera or sections included *Lichtensteinia*, Wendl. (1810) and *Spirostylis*, Presl (1829), in addition to the five genera segregated by Martius. The new groups proposed by Blume were: *Dendropemon*, *Lipotactes*, *Phoenicanthemum*, *Loxanthera*, *Tapinanthus*, *Elytranthe*, *Macrosolen*, *Tolypanthus* and *Lepeostegeres*. He restricted *Tristerix*, Mart., to *L. tetrandrus*, Ruiz & Pav., transferring to *Macrosolen* the two Asiatic species included by Martius.‖

A. P. De Candolle proposed a very different classification of *Loranthus* in 1830. This was published inoutline in his memoir on the *Loranthaceae*, and elaborated in the Prodromus. De Candolle corresponded with Blume about the *Loranthaceae* in 1829, and knew of Blume's unpublished genera, *Lepeostegeres*, *Elytranthe* and *Loxanthera*,¶ but was unacquainted with the remaining ones until after the completion of his work. He saw Martius's classification, however, in time to incorporate it in the Addenda to vol. iv. of the Prodromus. The following synopsis of De Candolle's classification indicates how Blume's groups correspond with De Candolle's.

Sect. I. Euloranthus, DC. Petals free; anthers basifixed or adnate.—*Loranthus*, *Dendropemon*, *Lipotactes*, *Phoenicanthemum*, *Dendrophthöe* (part), *Phthirusa*, *Struthanthus* (part).

Sect. II. Symphyanthus, DC. Petals united into a regular corolla; anthers basifixed.—*Dendrophthöe* (part), *Elytranthe*, *Macrosolen* (part), *Tolypanthus*, *Lepeostegeres*.

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* Flora, 1830, vol. i., p. 102.

† Gamble in Journ. As. Soc. Beng., vol. lxxv., pp. 378, 369 (1914); Eichler in Fl. Bras, vol. v., pars. 2, p. 47 (1868).

‡ Mus. Bot. Lugd.-Bat., vol. i., p. 243.

§ On p. 10 he quotes Bot. Zeit., 1830, No. 7; Pfeiffer is therefore incorrect in stating that Blume's Fl. Jav. Loranth. were published in 1829.

‖ Fl. Jav. Loranth., p. 17.

¶ DC. Prodr., vol. iv., pp. 296, 298, 299, 316.

Sect. III. Scurrula, DC. Petals united into a corolla which is split unilaterally; anthers basifixed.—*Dendrophthöe* (part), *Lichtensteinia*, *Tapinanthus*, *Macrosolen* (part).

Sect. IV. Notanthera, DC. Petals nearly free, or united at the base into a regular corolla; anthers dorsifixed.

Subsect. 1. Oscillanthera, DC. Anthers versatile.—*Psittacanthus*, *Tristerix*, *Spirostylis*, *Struthanthus* (part).

Subsect. 2. Loxanthera, DC. Anthers not versatile.—*Loxanthera*, Blume.

Endlicher adopted Blume's classification with little modification: he reduced *Lichtensteinia* to *Tapinanthus*, and divided *Dendrophthöe* into two subsections *Cichlanthus* and *Eudendrophthöe*.*

In 1860 Grisebach founded the new section *Oryctanthus* on *Loranthus occidentalis*, Linn.† Two years later Oliver published a provisional arrangement of the species of *Loranthus* in 22 sections, but gave no names to those of his groups which were new.‡ Section 15 was based on *L. undulatus*, E. Mey., and *L. Acaciae*, Zucc., on which the sections *Plicopetalus* and *Tapinostemma* were respectively founded by Bentham. Section 18 included, in addition to some Asiatic species, two new African ones, *L. Mannii* and *L. Kirkii*, on which the sections *Sycophila* and *Acrostachys* were based by subsequent authors.

The Brazilian *Loranthaceae* were revised by Eichler in 1868.§ He proposed the new genus *Phrygilanthus*, which included *Tristerix* (as restricted by Blume) and part of *Struthanthus*. He raised *Loranthus* sect. *Oryctanthus*, Griseb. to generic rank, and established two subgenera of *Psittacanthus*, *Eupsittacanthus* and *Aëtanthus*, characterized respectively by versatile and non-versatile anthers.

Bentham recognized only two genera of the tribe *Lorantheae*, *Nuytsia* and *Loranthus*, and divided the latter into 20 sections.‖ Four of these were new: *Acrostachys*, founded on *L. Kirkii*, Oliv.; *Plicopetalus*, founded on *L. undulatus*, E. Mey.; *Tapinostemma*, based on *L. Acaciae*, Zucc.; and *Heteranthus*, which included numerous species from the Malay Archipelago, Australia and New Zealand, and a single one, *L. Mannii*, from tropical Africa.

Bentham made the presence of a ventral tooth at the apex of the filament the criterion of the section *Tapinanthus*, in which he accordingly included *L. dodonaeifolius*, DC., and *L. Schimperi*, Hochst., in addition to *L. lanceolatus*, Beauv. (*L. Belvisii*, D.C.) and its allies.

In 1889 Engler followed Bentham in his treatment of the Old-world sections, accepting eleven of those defined by Bentham, but segregating the sections *Macrosolen*, *Elytranthe* and *Lepeostegeres* as a distinct genus, *Elytranthe*, Blume (sensu latiore).¶ He followed Eichler in regard to the American sections, recognizing

* Endl. Gen. Plant., vol. ii., p. 801.
† Fl. Brit. W. Indies, p. 313.
‡ Journ. Linn. Soc., vol. vii., pp. 97-102.
§ Martius, Fl. Bras., vol. v., pars 2, pp. 1–135.
‖ Bentham & Hooker, Gen. Pl., vol. iii., p. 207 (1880).
¶ Engl. & Prantl, Nat. Pflanzenfam. vol. iii., 1, p. 183.

these as distinct genera; he raised *Psittacanthus*, subgenus *Aëtanthus*, Eichl., to generic rank, and revived the genus *Gaiadendron*, G. Don.; Eichler had included the latter in *Phrygilanthus*, whereas Bentham recognized *Phrygilanthus* and *Gaiadendron* as distinct sections of *Loranthus*.

In 1894 Engler revised the African species of *Loranthus*, and established a new section, *Ischnanthus*, distinguished from *Tapinanthus* by tetramerous flowers.* He divided the section *Dendrophthöe* into 16 series, and *Tapinanthus* into four. *Dendrophthöe*, series *Oleaefolii*, was based on *Loranthus elegans*. Cham. & Schlecht., which, following Harvey, he erroneously identified with *L. oleaefolius*, Cham. & Schlecht. The African species on which *Tapinanthus*, Blume, was originally based, were included in *Tapinanthus*, series *Constrictiflori*. In 1895 Engler reduced the section *Tapinostemma* to *Plicopetalus*.†

Engler published a revised classification of Loranthaceae in 1897, adopting as sections or series of *Loranthus* many groups which Van Tieghem had published in the meantime as independent genera.‡ He restored generic rank to *Loxanthera*, Blume, and recognized as valid Van Tieghem's genus *Peristethium*. He divided *Loranthus* into four subgenera, sixteen sections and fifty-three series. Two of the subgenera were composed of both sections and series, one included series only, and the fourth one sections only.

For the details of Engler's classification, Nachtrag i. of the Pflanzenfamilien must be consulted. The following synopsis of the African groups recognized by him may be found useful.

Subgenus I. Euloranthus, Engl. Petals free, without basal folds.

Sect. VII. Sycophila, Engl. (only African section).

Subgenus II. Dendrophthoe, Engl. Petals united, without basal folds; filaments without a tooth.

This includes the African series: 4. *Laxiflori*, 5. *Ambigui*, 9. *Lichtensteinia*, 10. *Acranthemum*, 11. *Englerina*, 12. *Longiflori*, 14. *Involutiflori*, 15. *Rigidiflori*, 17. *Cinerascentes*, 18. *Lepidoti*, 19, *Cupulati*, 20 *Metula*, 21. *Rufescentes*, 22. *Infundibuliformes*, 23. *Inflati*, 25. *Hirsuti*, 27. *Longicalyculati*.

Subgenus III. Tapinanthus, Engl. Petals united, without basal folds; filaments with a tooth in front of the anther.

Sect. I. Ischnanthus. Flowers tetramerous. Series 1. *Astephaniscus*, 2. *Stephaniscus*.

Sect. II. Pentatapinanthus. Flowers pentamerous. Series 1. *Coriaceifolii*, 2. *Purpureiflori*, 3. *Obtectiflori*, 4. *Dentimetula*, 5. *Constrictiflori*.

Subgenus IV. Plicotepalus, Engl. Petals free or united, provided with basal folds.

Sect. I. *Acrostachys*, II. *Euplicotepalus*, III. *Tapinostemma*.

During the period 1901-1909 the following new groups were described by Engler, the two last in collaboration with Krause:

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* Engl. Jahrb., vol. xx., pp. 81–130.

† Pflanzenwelt Ost.-Afr., vol. C. p. 167.

‡ Engl. & Prantl, Nat. Pflanzenfam. Nachtr., i., pp. 127-133.

Tapinanthus, series *Eubracteati*, founded on *Loranthus proteicola*, Engl. and *L. nigritanus*, Hook. f.;* *Dendrophthöe*, series *Diplobracteati*, based on *Loranthus kwaiensis* Engl.;† *Euloranthus*, sect. *Lepidotepalum*, based on *L. periclymenoides*, Engl. & Krause;‡ *Tapinanthus*, series *Breviflori*, founded on *L. viminalis*, Engl. & Krause.§

When the writer described the *Loranthaceae* of tropical Africa in 1910, he rejected the division of *Loranthus* into subgenera, sections and series, as being unnecessarily complicated, and leading to the formation of artificial groups.‖ For example, *Euloranthus*, sect. *Sycophila*, is unquestionably more closely allied to *Plicotepalus*, sect. *Acrostachys*, than the latter is to the two other sections of *Plicotepalus*. The subgenera *Dendrophthöe* and *Tapinanthus* appear to be artificial, individual groups assigned to the one subgenus having their closest allies in groups belonging to the other. Thus the *Rufescentes* appear to be allied to the *Eubracteati* and *Erectilobi*, whilst the *Infundibuliformes* seem to be related to the *Purpureiflori*. The only character by which *Tapinanthus* can be distinguished from *Dendrophthöe* is the presence of a tooth on the filament; this tooth is sometimes very minute (0·1–0·17 mm. in *L. Holstii*) and may be easily overlooked. Thus the genus *Englerina* (*Dendrophthöe*, series *Englerina*, Engl.) was founded by Van Tieghem on *Loranthus Holstii*, Engl., on the strength of the inaccurate statement that this species had no tooth.¶ Engler himself originally referred *L. Holstii* correctly to the section *Ischnanthus*, in spite of the tooth being, as he thought, missing. Similarly *L. irangensis*, Engl. (*Tapinanthus* series *Purpureiflori*) was re-described fourteen years later as a new species, assigned to *Dendrophthöe*, series *Infundibuliformes*, owing to the tooth on the filament being overlooked.** The latter case illustrates the close resemblance which individual groups of the subgenus *Dendrophthöe* bear to others of the subgenus *Tapinanthus*, which suggests that the presence of a tooth on the filament has no greater taxonomic value than transverse septation of the anthers, or the presence of verticillately branched hairs.

The writer accordingly divided the tropical African species of *Loranthus* into 29 sections: twenty-four of these representing groups previously recognized by Engler, and five being new.†† He reduced the following groups: *Englerina*, *Metula*, *Inflati*, *Dentimetula* and *Breviflori*. *Loranthus viminalis*, Engl. & Krause, the type of the *Breviflori*, is in the writer's opinion a species allied to *L. Adolfi-Friderici* and *L. rugegensis*. The flowers appear to be galled; similar flowers occur, along with normally developed ones, in *L. Ehlersii* and *L. woodfordioides*, and have been found to contain larvae. Krause still maintains, however, that the flowers are normal, and has accordingly revived the series *Breviflori*.‡‡

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* Engl. Jahrb., vol. xxx., p. 303 (1901).
† ———————, vol. xl., p. 522 (1908).
‡ ———————, vol. xliii., p. 400 (1909).
§ ———————, vol. xliii., p. 314 (1909).
‖ Dyer, Fl. Trop. Afr., vol. vi., sect. 1, p. 256.
¶ Bull. Soc. Bot. France, vol. xlii., p. 257; Engl. Jahrb., vol. xx., p. 126.
** Engl. Jahrb., vol. xx., p. 111; vol. xl., p. 527.
†† These are the *Tetrameri*, *Incrassati*, *Remoti*, *Rhamnifolii* and *Erectilobi*.
‡‡ Engl. & Prantl, Nat. Pflanzenfam. Nachtr., iv., p. 73.

The re-identification of *Lichtensteinia oleaefolia*, Wendl., entails change in the nomenclature of the African sections. *Lichtensteinia*, Wendl., is a synonym of *Tapinanthus*, Blume, which corresponds to the series *Constrictiflori*, Engl. The sectional name *Moquinia* is now adopted for the group which has passed in recent years under the erroneous generic and serial names *Lichtensteinia* and *Oleaefolii*.

The synonymy of the two sections is as follows:

Sect. Tapinanthus, *Blume*, Fl. Jav. Loranth. p. 15; Endl. Gen. Pl. vol. ii. p. 802, excl. *Moquinia*; Benth. in Benth. & Hook. f. Gen. Pl. vol. iii. p. 210, excl. *L. dodonaeifolius* et *L. Schimperi*; Engl. in Ergl. & Prantl, Nat. Pflanzenfam. vol. iii. i, p. 187, partim. Genus *Tapinanthus*, Blume apud Schult. Syst. Veg. vol. vii. p. 1730 (1830); Van Tiegh. in Bull. Soc. Bot. France, vol. xlii. p. 267, partim. Genus *Lichtensteinia*, Wendl. Coll. Pl. vol. ii. p. 4 (1810); Blume apud Schult. Syst. Veg. vol. vii. p. 1730. *Loranthus*, sect. *Lichtensteinia*, Blume, Fl. Jav. Loranth. p. 14. *Loranthus*, subgen. *Tapinanthus*, sect. *Pentatapinanthus*, ser. *Constrictiflori*, Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. i. p. 133, partim. Sect. *Constrictiflori*, Sprague in Dyer Fl. Trop. Afr. vol. vi. sect. i, pp. 257, 268.

Type-species: *L. lanceolatus*, Beauv., *L. sessilifolius*, Beauv. The section comprises nearly 40 species including *L. oleaefolius*, Cham. & Schlecht., the type of sect. *Lichtensteinia*. It seems inadvisable to employ the prior name *Lichtensteinia* for the above section, as this might lead to confusion.

Sect. Moquinia, *Sprague*. Genus *Moquinia*, A. Spreng. Tent. Suppl. Syst. Veg. p. 9 (1828). *Loranthus*, sect. *Dendrophthöe*, series *Oleaefolii*, Engl. in Engl. Jahrb. vol. xx. p. 83. Genus *Lichtensteinia*, Van Tiegh. in Bull. Soc. Bot. France, vol. xlii. p. 254, non Wendl. *Loranthus*, subgen. *Dendrophthöe*, ser. *Lichtensteinia*, Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. i. p. 131.

Type and sole species: *L. elegans*, Cham. & Schlecht.

Engler and Krause have recently described the two new series *Longitubulosi* and *Botryoloranthus*, both included in the subgenus *Dendrophthöe*. *Botryoloranthus* seems from description to be a valid group allied to *Tetrameri*; whereas the series *Longitubulosi* is almost certainly identical with the genus *Septulina*, Van Tiegh., which Engler reduced to the *Cinerascentes*. *Septulina* differs, however, from the latter in having tetramerous flowers with erect corolla-lobes and filaments, and is accordingly retained by the writer as a section.

Sect. Septulina, *Sprague*. Genus *Septulina*, Van Tiegh. in Bull. Soc. Bot. France, vol. xlii. p. 263 (1895). *Loranthus*, subgen. *Dendrophthöe*, series *Cinerascentes*. Engl. in Engl. & Prantl, Pflanzenfam. Nachtr. i. p. 131, partim. *Loranthus*, subgen. *Dendrophthöe*, series *Longitubulosi*, Engl. & Krause in Engl. Jahrb. vol. li. p. 455 (1914).

Type species: *Loranthus glaucus*, Thunb. (*L. longitubulosus*, Engl. & Krause, l.c., ex. descriptione), *L. ovalis*, E. Mey.

LXVIII.—HEDYCHIUM CORONARIUM AND ALLIED SPECIES.

W. B. TURRILL.

(With Plates.)

Recent investigations into the possibilities of using species of *Hedychium* as a source of material for paper-making* have made it particularly desirable that a clear understanding of the exact botanical position of the plants experimented with should be obtained. The species dealt with in the present paper are all closely allied to one another, and the extreme difficulty experienced in dealing with dried specimens had resulted in great confusion of names and the sorting together of distinct forms. The latest monograph of *Hedychium* is that by K. Schumann in Engler's Pflanzenreich, 20. Heft (iv. 46), 1904, but it adds little to our knowledge of *H. coronarium* and its allies. Two older works dealing with the genus must be mentioned, the one, Roscoe's "Monandrian Plants of the Order Scitamineae," was published at Liverpool in 1828 and contains beautiful coloured plates of many species with corresponding descriptions in English, the other, Wallich's "Attempt to define the species of Hedychium," was published in the Kew Journal of Botany, V., p. 321, 1853, and contains Latin diagnoses of 23 species with full lists of synonyms.

It is proposed here to enumerate those species which have been considered by various authors to be varieties of *H. coronarium* and to give briefly the most important characters of each, but mention must first be made of *H. coronarium* itself. This most widely distributed and commonly cultivated species of *Hedychium* was described by Koenig in Retz. Obs. iii. p. 73, 1783, and has the following characters which distinguish it from other species of the genus: bracts large, coriaceous, closely imbricated, forming a more or less ovate strobilus and each protecting from four to six flowers which arise in succession; calyx tubular, split on one side, less than half the length of the corolla-tube, glabrous; corolla-tube 6–8 cm. long, cylindrical; corolla-segments 3, linear-lanceolate, equal, declined; lip large, broad, abruptly narrowed at the base, divided—but generally not deeply—into two elliptic-ovate lobes which are sometimes further lobed, pure white or slightly yellow in the lower part; lateral staminodes oblong- or ovate-elliptic, pure white or yellowish in the lower part; filament with the anther shorter than the lip, white or yellowish; the inferior ovary glabrous or slightly or densely hairy in the flowering stage. This plant is found wild or naturalized in most tropical countries. Good figures are to be found of it in: Roscoe, Monandr. Pl. t. 51; Bot. Mag., t. 708; Smith, Exotic Plants, ii., t. 107.

The *H. maximum* of Roscoe, Monandr. Pl., t. 52, is probably a variety of *H. coronarium*, distinguished by having broader leaves, distinctly ciliated bracts, large flowers, the lateral staminodes frequently with a lobe or tongue projecting from the centre, the filament tinged with pink, and the ovary and calyx densely pubes-

* See Kew Bulletin, 1912, p. 373; 1914, pp. 165, 193.

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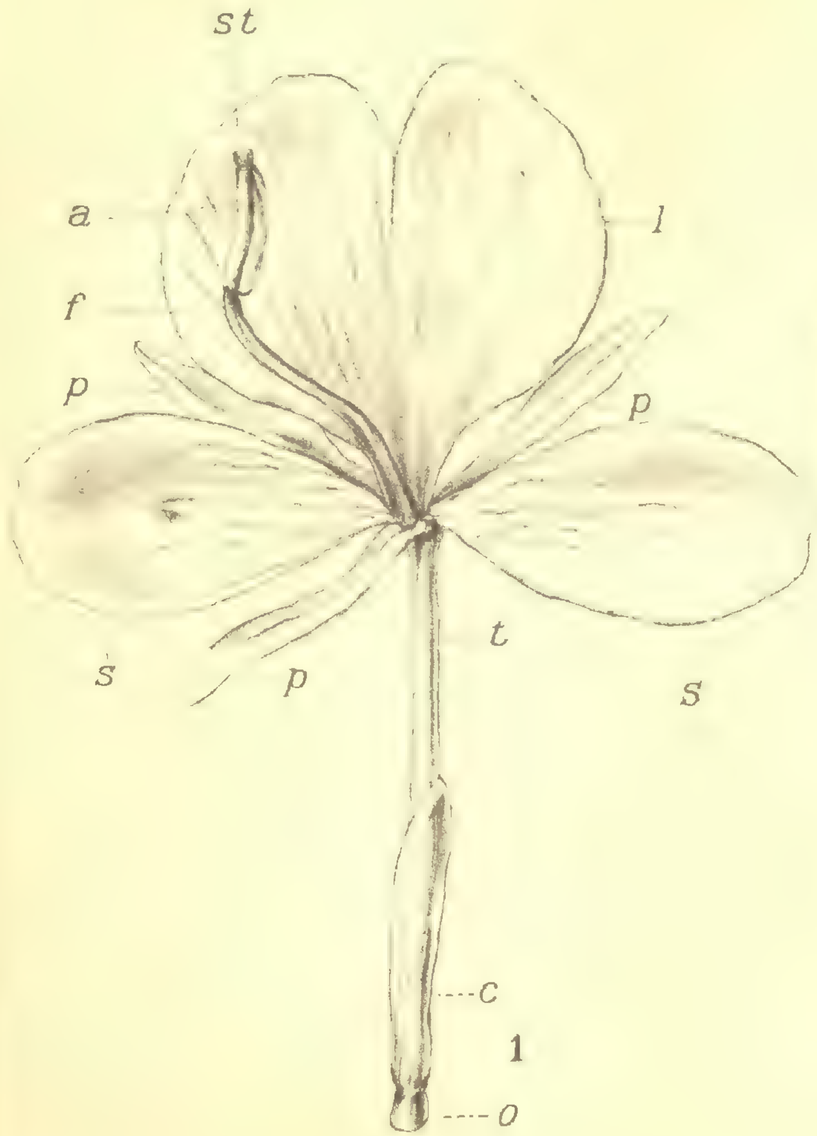

M. Smith. del.

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cent. The writer has seen only one specimen of *H. maximum* and that a cultivated one. Its native country is unknown.

Two species which are closely related to *H. coronarium* and which in common with it have the filament and anther together shorter than the lip must now be considered. Both have yellow flowers which are smaller than those of *H. coronarium*. The first, *H. urophyllum*, Lodd., Bot. Cab., t. 1785, 1831, has frequently been reduced either to *H. coronarium* or to *H. flavum* or kept as a variety of one of these species, but in accordance with our present knowledge it seems best to consider it a distinct species specially characterised by having all the parts of the corolla and androecium deep yellow in colour, the lip entire or with only a slightly bilobed or undulating margin, and a stout filament which with the anther is distinctly shorter than the lip. The only flowering specimens of this plant at Kew are from Khasia, 900–1200 m. There is an excellent figure in the Botanical Magazine, t. 3039, under the name *H. flavum*, Roxb., from which plant, however, it is quite distinct, having larger flowers and a relatively shorter calyx.

The second species, *H. Elwesii*, is also known only from the Khasia Hills district, where it has been collected by H. J. Elwes and C. B. Clarke and figured by Sir J. D. Hooker. It was described by J. G. Baker in the Flora of British India, vi., p. 226, 1892, and has the following distinguishing features: flowers bright yellow; lip broad and distinctly two-lobed; filament slender, of a bright red colour.

Hedychium flavescens, Carey ex Roscoe, Pl. Monandr., t. 50, is a distinct species with the following important characters: flowers large, up to 14 cm. long, yellowish, the colour deeper in the basal portion; calyx nearly half as long as the corolla-tube; lip obovate-orbicular, bilobed, narrowed below to form a distinct claw; filament with the anther slightly longer than the lip. Apparently wild specimens of this plant are preserved at Kew from India and the Mascarenes, and it is often found in cultivation. Besides the accurate figure in Roscoe's work that in Wallich's Icones, t. 2008-9, may be mentioned.

Hedychium chrysoleucum, Hook., figured and described in Bot. Mag., t. 4516, is probably only a form of *H. flavescens*, with the base of the lip and lateral staminoides a deep orange-yellow. This form is also figured in Lindley and Paxton, Flower Garden, p. 110, t. 77.

We have now to deal with two plants concerning which there has been an unfortunate confusion. The name *Hedychium flavum* was first applied by Roxburgh in the Hortus Bengalensis. p. 1, 1814, to a plant called by the natives Kattea-tilook-seer, and said to have been collected in Silhet by Mr. M. R. Smith in 1810. There is at Kew one of Roxburgh's drawings, No. 2153, named *H. flavum*, R., and this, on the whole, agrees with the description published in Roxburgh's Flora Indica, 1., p. 81, 1820, which was edited by W. Carey with the assistance of Wallich, but here the native name is given as Kattia-rityam. In the manuscript editions of Roxburgh's Flora Indica at Kew and the British Museum Catteah-tilluk-see and Catteek-tilluk-seer are given as the vernacular names of *H. flavum*. Whatever Carey and Wallich

intended by *H. flavum* there seems no doubt that the plant intended by Roxburgh is quite different from that to which Roscoe, Pl. Monandr., t. 49, and most authors since his time have applied the name. The main distinguishing characters of *H. flavum*, Roxb., are: leaves with a long fine acumen; spike oblong, with imbricate bracts which are oblong-ovate, subobtuse, about two and a half inches long and nearly one and a half broad; calyx nearly as long as the corolla-tube; lip obcordate, narrowed suddenly below into a very short claw, yellow with an orange patch in the centre and below; the filament with the anther about as long as or slightly shorter than the lip; ovary pubescent.

7. *H. flavum.*

8. *H. subditum.*

For the *Hedychium flavum* of Roscoe, non Roxb., the name *H. subditum*, Turrill, is proposed. The plant is distinguished by having flowers 10-11 cm. long, a calyx about half as long as the corolla-tube, an ovate bilobed or obcordate lip which is narrowed into a distinct claw below, and by a filament which with the anther is distinctly longer than the lip. The plant named *H. flavum* in Lodd., Bot. Cab., t. 604 is probably this species.

The plants represented in Bot. Mag., t. 2378 and Lodd., Bot. Cab., t. 723 are very similar, and both are probably hybrids between *H. spicatum*, J. E. Sm., and *H. subditum*, Turrill.

In order to facilitate the identification of specimens the following key to the species dealt with above has been prepared:

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Flowers pure white or with only a tinge of yellow.
Lip about 4·75 × 4 cm. *H. coronarium*, Koenig.
Lip 6·75 × 4·5 cm. *H. maximum*, Roscoe.
Flowers yellow to orange.
Lip entire, slightly bilobed or with a wavy margin; filament stout, yellow. *H. urophyllum*, Lodd.
Lip distinctly bilobed.
Filament slender, of a bright red colour; lip broad. *H. Elwesii*, Baker.
Filament yellow.
Flowers 13 to 14 cm. long.
Lip and lateral staminodes yellow. *H. flavescens*, Roscoe.
Lip and lateral staminodes deep or orange-yellow towards the base. *H. chrysoleucum*, Hook.
Flowers 8 to 11 cm. long.
Calyx nearly as long as the corolla-tube; filament with the anther as long as or slightly shorter than the lip. *H. flavum*, Roxb.
Calyx about half as long as the corolla-tube; filament with the anther distinctly longer than the lip. *H. subditum*, Turrill.

It has already been stated that much of the confusion which is found in the systematic works dealing with *Hedychium* is due to the difficulty of working satisfactorily with dried material. The large majority of the specimens preserved in the Kew and British Museum Herbaria are leafy inflorescences which were dried entire with the flowers still on, and no attempt was made to preserve the shape of the floral parts. Consequently, it is often impossible to make out such important characters as the shape of the lateral staminodes and labellum and the relative length of the filament. Moreover, the usual method of preparing dried flowers for dissection by boiling in water is not satisfactory here, for with such treatment they generally form a soft pulpy mass from which their original structure cannot be determined. However, if the following hints are carefully followed the preparation of adequate herbarium specimens is a comparatively simple matter. A specimen should be selected which is in full flower and a complete stem taken and cut up into suitable lengths of about 15 inches. Each length should be numbered, so that on examination of the dried material the sequence of the specimens is obvious. The leafy portions can be dried in the ordinary manner, the leaves when larger than the sheet of drying paper being carefully bent over. A few leaves with complete ligules should be dried separately. The inflorescence is best taken with two or three leaves still attached just below it, and sliced down the centre, each half being dried alone. The chief care, however, should be given to the drying of individual flowers. Buds, young, mature and old flowers should be taken from the axils of the bracts and laid separately between sheets of blotting or other absorbent paper. It is essential that each flower so dried should be complete, and care is needed to ensure that the small inferior ovary is detached from the inflorescence with each flower taken. The various floral parts, perianth

segments, lateral staminodes and labellum should be spread out flat, and, as far as possible, should not overlap one another. Under moderate pressure the flowers soon dry, and the paper actually containing the flowers should not be changed until drying is complete.

As it seems likely that species of *Hedychium* may attain considerable economic importance in the future, it is to be hoped that correspondents desiring names for plants of this genus will forward specimens which have been dried according to the instructions here given.

EXPLANATION OF PLATES AND FIGURES IN TEXT.

The figures represent the flowers, all three-quarters natural size, of the species dealt with above. The various floral parts in the figure of *H. coronarium*, Koenig, have been given distinguishing letters, a key to which is given below. As the figures of all the flowers are drawn approximately with the same orientation, it will be easy to determine the different organs by comparison with this one figure and the key.

Figure 1. *Hedychium coronarium*, Koenig. o. ovary. c. calyx. t. corolla-tube. p.p.p. corolla segments. l. labellum or lip. ss. lateral staminodes. f. filament. a. anther. st. stigma.

Figure 2. *H. maximum*, Roscoe. From the type specimen in Herb. Kew., showing additional lobes on the lateral staminodes.

Figure 3. *H. urophyllum*, Lodd. From a specimen in Herb. Kew., collected by Hooker in the Khasia Hills.

Figure 4. *H. Elwesii*, Baker. From a specimen in Herb. Kew., collected by C. B. Clarke in the Khasia Hills.

Figure 5. *H. flavescens*, Roscoe. From a specimen cultivated in Ceylon.

Figure 6. *H. chrysoleucum*, Hook. Adapted from the figure of the type in Bot. Mag. t. 4516.

Figure 7 (text-figure). *H. flavum*, Roxb. From the drawing of the type plant in Herb. Kew.

Figure 8 (text-figure). *H. subditum*, Turrill. From a cultivated specimen preserved in Herb. Kew.

LXIX.—NEW ORCHIDS. DECADE 43.

421. **Cirrhopetalum formosanum,** *Rolfe*; a *C. elato*, Hook. f., foliis latioribus, scapis duplo brevioribus, et saepissime bifloris, et sepalis lateralibus longioribus differt.

Pseudobulbi approximati, ovoidei, vaginis ovatis acuminatis venosis vestiti, monophylli, 1–1·5 cm. longi. *Folia* breviter petiolata, elliptico-oblonga, acuta, coriacea, 7–10 cm. longa, 2·5–4 cm. lata; petioli 0·5–1 cm. longi. *Scapi* graciles, circiter 9 cm. longi. vaginis lanceolatis paucis obtecti, pauciflori. *Bracteae* oblongo-lanceolatae, acutae, subconcavae, 4 mm. longae. *Pedicelli* suberecti, 1 cm. longi. *Flores* mediocres, umbellati. *Sepalum* posticum oblongo-lanceolatum, acutum, concavum, eciliatum, 1·2

cm. longum; sepala lateralia linearia, acuta, subconcava, medio cohaerentia, glabra, 2·5 cm. longa. *Petala* falcato-oblonga, subobtusa, eciliata, 5 mm. longa. *Labellum* recurvum, carnosum, oblongum, obtusum, 4 mm. longum. *Columna* oblonga, 2 mm. longa, basi subauriculata; dentes lineari-spathulati, 1·5 mm. longi.

FORMOSA. *W. R. Price.*

A Formosan species which was sent to Kew by Mr. W. R. Price two years ago and has flowered on two or three occasions. The flowers are straw-yellow, with a deep yellow lip and a suffusion of pink in the petals.

422. **Ione flavescens,** *Rolfe*; affinis *I. Andersoni*, King et Pantl., sed scapis bifloris et partibus omnibus majoribus differt.

Rhizoma repens. *Pseudobulbi* subdistantes, depresso-ovoidei, 1 cm. longi, 1–4 cm. lati, monophylli. *Folia* lineari-oblonga, subobtusa, circiter 5·5 cm. longa, 1 cm. lata. *Pedunculi* laterales, breves, circiter 2 cm. alti, vaginis ovato-oblongis imbricatis obtecti, biflori. *Flores* mediocres. *Sepala* reflexa, ovato-oblonga, subacuta, 0·8–1 cm. longa, marginibus revolutis. *Petala* subpatentia, lineari-oblonga, subobtusa, 8 mm. longa, basi latiora et ciliata. *Labellum* erectum, 6–7 mm. longum, subcarnosum, basi suborbiculare, denticulatum, concavum, transverse incrassatum, apice lineari-oblongum, angustum et subobtusum. *Columna* lata, 2 mm. longa. *Pollinia* 4, per paria stipitibus 2 distinctis affixa, glandula squamiformi duplici.

BURMA. Mount Victoria, *Mrs. Wheeler Cuffe.*

Flowered in the Royal Botanic Garden, Glasnevin, in September, 1914, when it was sent to Kew for determination by Sir Frederick W. Moore. It was allied to *Ione Andersoni*, King & Pantl., and like it has the pollinia attached in pairs to two clavata stipes situated on either side of the broad column, and each with a distinct squamiform gland. The sepals are pale yellowish-green, and the petals and lip deep yellow.

423. **Coelogyne siamensis,** *Rolfe*; affinis *C. lentiginosae*, Lindl., sed floribus majoribus et labelli carinis verrucosis differt.

Pseudobulbi ovoidei vel ellipsoideo-ovoidei, 2·5–4 cm. longi, basi vaginis ovatis membranaceis obtecti, apice diphylli. *Folia* breviter petiolata, elliptica vel elliptico-oblonga, acuta vel breviter acuminata, subundulata, plicata, 13–15 cm. longa, 4–5 cm. lata; petiolus 1·5 cm. longus. *Scapus* inter pseudobulbum rudimentum et bracteam imbricatum emissus, erectus, circiter 10 cm. altus, pauciflorus. *Bracteae* elliptico-oblongae, subobtusae, valde concavae, 1·5–2 cm. longae. *Pedicelli* 1·5 cm. longi. *Flores* magni. *Sepalum* posticum erectum, late elliptico-oblongum subacutum, concavum, 3·5 cm. longum, 1·7 cm. latum; sepala lateralia subpatentia, lanceolato-oblonga, acuta, carinata, 3 cm. longa, 1 cm. lata. *Petala* patentia, lanceolato-linearia, 3·2 cm. longa, *Labellum* erectum, trilobum, 2·5 cm. longum; lobi laterales erecti, oblongi, obtusi, 1·2 cm. longi; lobus intermedius obovato-orbicularis, subacutus, 1·5 cm. latus; discus tricarinatus, verrucosus, carina intermedia brevi et basi lata. *Columna* clavata, 2 cm. longa.

SIAM. Bangkok, *C. Roebelen.*

Flowered at Kew in October, 1914. The plant has much of the general appearance of *C. lentiginosa*, Lindl., except that the bulbs are much more ovoid, and the flowers larger and at present only two in number; but the crest of the lip is very different, the keels being broken up into a number of wart-like papillae, and the middle one short and broad at the base. The sepals and petals are pale green, and the lip light yellow, with a broad dark brown margin to the side lobes, some brown streaks and dots on the disc, and some bright yellow at the apex of the lateral keels and the base of the central one.

424. **Arundina subsessilis,** *Rolfe*; species distincta, floribus ad apices ramorum subsessilibus facile distinguenda.

Caules erecti, circiter 25 cm. alti, foliosi. *Folia* sessilia, disticha, recurva, lanceolata, acuminata, 10–14 cm. longa, 1·5–1·8 cm. lata, basi subamplexicaulia. *Flores* terminales, pauci, mediocres, subsessiles. *Bracteae* oblongo-lanceolatae, acuminatae, 1–2 cm. longae. *Sepala* subpatentia, lanceolato-oblonga, subacuta vel apiculata, circiter 1·3 cm. longa. *Petala* elliptico-oblonga, subobtusa, 1·1 cm. longa. *Labellum* subintegrum, late ellipticum, obtusum, crispo-undulatum, 1·1 cm. longum; discus 5-lamellatus. *Columna* clavata, 1 cm. longa.

Upper Burma.

Introduced by Messrs. Sander and Sons, and flowered in the collection of Mr. H. J. Elwes, Colesborne, Gloucestershire, in September, 1914. It is said to be completely herbaceous. The flowers are nearly white, with lilac-purple tips to the sepals and petals, a violet-purple zone round the limb of the lip just inside the margin, and the keels yellow.

425. **Eulophia subintegra,** *Rolfe*; in Dyer Fl. Cap. vol. v. sect. iii. p. 41, anglice; habitu *E. Rehmanni*, Rolfe, sed petalis angustioribus et labello subintegro valde differt.

Folia elongato-lanceolata, acuta vel acuminata, plicata, 22–30 cm. longa, 3–5 cm. lata (basin non vidi). *Scapi* graciles, 25 cm. alti, vaginis paucis obtecti (basin non vidi); racemi laxi, 10 cm. longi. *Bracteae* lineari-lanceolatae, acuminatae, 1·2–1·8 cm. longae. *Pedicelli* 1·2 cm. longi. *Flores* majusculi. *Sepala* lineari-lanceolata, acuminata, 1·8 cm. longa, brunnea. *Petala* oblonga vel elliptico-oblonga, subacuta, 1·8 cm. longa, sepalis plus duplo latiora, flava. *Labellum* integrum vel subintegrum, ellipticum, subobtusum, petalis brevius et latius; discus leviter puberulus, 7–9 carinatus, supra in venos numerosos extensus; calcar elevatum, 5 mm. longum.

South Africa. Natal: damp places at Oliviers Hook; sources of the Tugela River, 1530 m., *Allison* 8.

426. **Eulophia Sankeyi,** *Rolfe*; in Dyer Fl. Cap. vol. v. sect. iii. p. 46, anglice; ab *E. fragrante*, Schlechter, petalis latioribus, labello subtrilobo differt.

Rhizoma non vidi. *Folia* 3–4, fasciculata, oblongo-linearia, acuta, 10–15 cm. longa, paullo recurva, venis primariis 5, basi squamis paucis obtecta. *Scapi* 22 cm. longi, validi, vaginis

plurimis late oblongo-lanceolatis imbricatis obtecti; racemi circiter 10 cm. longi, laxiusculi, 10–12-flori. *Bracteae* ovato-lanceolatae vel elliptico-lanceolatae, breviter acuminatae, 1·2–1·8 cm. longae. *Pedicelli* circiter 1·8 cm. longi. *Flores* majusculi, ochroleuci. *Sepala* ovato-lanceolata, acuta, 1·8–2·5 cm. longa, postico lateralibus paullo latius. *Petala* ovata, acuta vel breviter et abrupte acuminata, sepalis duplo latiora. *Labellum* ovatum, breviter trilobum, petalis paullo minori; lobi laterales breves, apice rotundati; lobus intermedius late ovatus, apiculatus vel subacutus, subundulatus; discus medio ad basin 5–7-carinatus, carinis incrassatis verrucosis; calcar oblongum, subobtusum, 3 mm. longum. *Columna* clavata, 6 mm. longa, basi in pedem brevem producta; anthera minute apiculata.

South Africa. Orange River Colony; Harrismith, *Sankey* 306.

427. **Eulophia inandensis,** *Rolfe*; in Dyer Fl. Cap. vol. v. sect. iii. p. 47, anglice; ab *E. bilamellata*, Schlechter, labello latiore et subintegro differt.

Rhizoma et *folia* non vidi. *Scapi* circiter 30 cm. longi, basi vaginis brevibus oblongo-lanceolatis obtecti; racemi 7·5 cm. longi, 7–8-flori. *Bracteae* lanceolatae, acuminatae, 4–6 mm. longae. *Pedicelli* circiter 7 mm. longi. *Flores* mediocres, flavi et brunnei. *Sepala* elliptico-oblonga, apiculata, circiter 7 mm. longa. *Petala* elliptica, subobtusa, sepalis brevioribus et multo latioribus. *Labellum* ovatum, obtusum, subintegrum, petalis aequale; discus carinis incrassatis et paullo verrucosis instructus; calcar conicum, obtusum, circiter 6 mm. longum. *Columna* clavata, circiter 6 mm. longa; anthera obtusa.

South Africa. Natal; Inanda, *Wood* 976.

428. **Eulophia Peglerae,** *Rolfe*; in Dyer Fl. Cap. vol. v. sect. iii. p. 49, anglice; affinis *E. inaequali*, Schlechter, sed labelli calcare multo breviore et lobis lateralibus amplioribus differt.

Rhizoma et *folia* non vidi. *Scapus* (basin non vidi) vaginis lanceolatis paucis obtecti; racemi breves, circiter 6–flori. *Bracteae* oblongo-lanceolatae, acuminatae, circiter 1·2 cm. longae. *Pedicelli* bracteis paullo longiores. *Flores* mediocres. *Sepala* oblongo-lanceolata, acuta, 1·2–1·4 cm. longa. *Petala* oblongo-lanceolata, subacuta, sepalis paullo breviora. *Labellum* profunde trilobum, circiter 1·2 cm. longum; lobi laterales oblongi, obtusi, subdivergentes, lobo intermedio fere acquilongo; lobus intermedius obovatus vel late obovato-oblongus, obtusus, 6 mm. longus; discus puberulus, carinatus, carina medio leviter verrucosa basi tenui; calcar latum, obtusum, brevissimum. *Columna* clavata, circiter 7 mm. longa, basi in pedem brevissimum extensa.

South Africa. Transkei; Kentani, *Miss Pegler in Herb. Bolus* 10,677.

429. **Polystachya Hislopii,** *Rolfe*; affinis *P. Lawrenceanae*, Kränzl., sed labelli lobo intermedio angustiore et valde recurvo, et disco callo lato et regulariter papilloso differt.

Herba epiphytica. *Pseudobulbi* caespitosi, ovoideo-oblongi vel fusiformi-oblongi, 3–5 cm. longi, 0·8–1·2 cm. lati, prope apicem

3–4-phylli, infra vaginis striatis purpureo-tinctis obtecti. *Folia* lanceolato-oblonga, subobtusa, 6–12 cm. longa, 0·8–1·5 cm. lata. *Pedunculi* terminales, circiter 12 cm. longi, subcompressi, villosuli, pauciflori, medio vagina subulata obtecta. *Bracteae* ovatae, breviter acuminatae, villosulae, 4–5 mm. longae, basi concavae. *Pedicelli* villosuli, 0·8–1 cm. longi. *Sepala* subpatentia, ovato-oblonga, subobtusa, subincurva, concava, extus villosula, posticum 1 cm. longum, 6 mm. latum, lateralia 1·2 cm. longa, 7 mm. lata. *Petala* incurva, obovato-lanceolata, subobtusa, 8 mm. longa, 3 mm. lata. *Labellum* trilobum, 8 mm. longum; lobi laterales suberecti, rotundati, obtusi, 4 mm. lati; lobus intermedius ovatus, acutus, valde recurvus, 5 mm. longus; discus callo lato regulariter papilloso instructus. *Columna* lata, 2 mm. longa, pede 5 mm. longo.

Tropical Africa. Rhodesia, *A. Hislop*.

Sent to Kew by Mr. Alexander Hislop, Makoni Kop, Rusapi, S. Rhodesia, and flowered in the collection in September, 1914. The sepals and petals are light emerald green, and the lip white, with a rose-coloured margin, a few similar radiating veins on the side lobes, and a few pale purple spots at the base of the front lobe. Except in the details of the lip there is a considerable resemblance to *P. Lawrenceana*, Kränzl., from the Upper Zambesi.

430. **Zygopetalum Prainianum,** *Rolfe*; affinis *Z. Burkei*, Reichb. f., sed pseudobulbis longioribus, foliis latioribus, et colore florum differt.

Herba terrestris. *Pseudobulbi* oblongi, basi paullo incrassati, sulcati, 3–10 cm. longi, apice 2–3 phylli. *Folia* ligulata vel elongato-oblonga, subobtusa, subarcuata, 20–35 cm. longa, 1·5–3 cm. lata, subcoriacea. *Scapi* erecti, circiter 60 cm. longi, basi vaginis spathaceis obtecti, 4–5 flori. *Bracteae* ovato-oblongae, subacutae, conduplicato-concavae, 1·5–2 cm. longae. *Pedicelli* 3–4 cm. longi. *Flores* speciosi. *Sepala* et petala patentia vel subreflexa, lanceolato-oblonga, subacuta, subcarnosa, circiter 2·5 cm. longa, 1 cm. lata. *Labellum* subpatens, pandurato-oblongum, subacutum, 2 cm. longum, 1·5 cm. latum, prope apicem subincurvum et crenulatum, basi callo crasso 11-jugo et dentato instructum. *Columna* clavata, incurva 1·5 cm. longa; alae triangulari-oblongae, 4 mm. longae.

Peru. *L. Forget*.

Imported by Messrs. Sander and Sons through their collector L. Forget, and flowered at St. Albans in September, 1914, afterwards passing into the Kew collection. The sepals and petals are dusky brown, with obscure green stripes on the petals, and the lip white with light rose-purple streaks on the fleshy ribs of the callus.

LXX.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

Decas LXXXIII.

821. **Capparis fusifera,** *Dunn* [Capparidaceae-Cappareae]; *C. brevispinae*, Wight et Arn., affinis, fructu fusiformi foliisque 8–12 cm. longis distincta.

Frutex scandens; rami primo tomentelli, mox glabri, spinis paucis parvis validis uncinatis armati. *Folia* lanceolata, acuminato-caudata, basi obtusa, 8–12 cm. longa, utrinque glabra, reticulata; venae erecto-patentes, utrinque 8–10, intra marginem arcuatim connexae; petioli 7–9 mm. longi. *Flores* axillares, 1–3–ni; pedunculi 1·4–1·6 cm. longi. *Fructus* fusiformis, gynophoro 1·5 cm. longo excluso 4–5 cm. longus, 1·5–2 cm. latus, deorsum sensim sed ad apicem subito acuminatus, rugosus, 3–locularis. *Semina* 1–3, superiore nonnunquam solum evoluto, 1·7 × 1·2 × 0·7 cm., castanea.

India. Madras Presidency: Tinnevelly District; Udumanparai, *Barber* 5726.

822. **Alsodeia grandiflora,** *Ridley* [Violaceae-Alsodeieae]; frutex *A. floribundae*, King, affinis, foliis longis subsessilibus, floribus multo majoribus, in genere maximis, petalis angustis linearibus lanceolatis distinctus.

Frutex 8–pedalis, glaber. *Folia* elliptico-lanceolata, acuminata, basi rotundata, 19–24 cm. longa, 5·5–9·5 cm. lata, membranacea, sicca grisea, nervis ascendentibus 10–paribus, nervulis transversis subtus elevatis, peticlo brevissimo ad 1 mm. longo. *Cymae* axillares vel extra-axillares, 4–7 cm. longae, pedunculo 2 cm. longo, ramis dichotomis, floribus pluribus albis. *Sepala* lanceolata, subacuta, in margine ciliata, dorso sericea, 3 mm. longa. *Petala* lineari-lanceolata, obtusa, 9 mm. longa, costa sericea. *Stamina* longa, filamentis antheras aequantibus hirtis, antheris angustis lanceolatis acutis, appendice terminali lanceolata. *Ovarium* villosum. *Stylus* cylindricus, villosus. *Discus* subprofundus, glaber, 5–lobatus.

Malay Peninsula. Singapore; in a wood at Anghio Kio, *Ridley* 6383; Johor, Ulu Batu Pahat, *Lake and Kelsall* 4042.

This has larger flowers than any species I know of in Asia, though there are some species in Africa, as, for instance, *A. elliptica*, Oliver, which have flowers nearly or quite as large.

823. **Alsodeia hirtella,** *Ridley* [Violaceae-Alsodeieae]; arbuscula, *A. Kunstlerianae*, King, affinis, sed foliis subtus, ramis floribusque rigide hirtis, sepalis latioribus suborbicularibus hirtis, petalis brevioribus truncatis et filamentis longioribus distincta.

Arbor parva, ramis hirtis. *Folia* lanceolata, longe acuminata, obtusa, basi inaequilateralia, angusta, obtusa, in margine serrulata vel integra, 14–24 cm. longa, 5–7 cm. lata, nervis 16–paribus cum costa et nervulis hirtis, petiolo 1·8–2 cm. longo. *Racemi* breves, axillares, 6–flori. *Bracteae* lanceolatae, acutae. *Flores* albi. *Sepala* exteriora 3, orbicularia, imbricata, extus

hirta, sicca venosa, interiora 2, glabra. *Petala* paullo longiora, imbricata, glabra, oblonga, obtusa, truncata, apice processubus paucis ornata. *Stamina* glabra, filamentis complanatis antheris aequilongis, antherarum loculis processubus 2 elongatis terminatis, appendice dorsali latiore ovata. *Ovarium* conicum, hirtum. *Stylus* cylindricus. *Capsula* pallide viridis, 1 cm. longa, valvis ovatis subacutis parce strigosis.

Malaya. Penang: Waterfall, *Curtis* 1898. Borneo: Sarawak, *Beccari* 2878; Mt. Buau, on limestone, *Haviland* 1997; Mt. Koum, *Haviland* 1715.

This has very much the appearance and habit of *A. Kunstleriana*, King, but is hairy and has curiously truncate petals with short processes at the tip.

824. **Pultenaea pauciflora,** *Scott* [Leguminosae-Podalyrieae]; affinis *P. viscosae*, R.Br., sed foliis mucronatis et floribus 1–2 tantum conspicue differt.

Frutex copicse et divaricate saepius pseudo-verticillatim ramosus, ramis primo cinereis mox castaneis, junioribus cano-villosis. *Folia* simplicia, lineari-lanceolata, falcata vel ensiformia, basi attenuata, pulvino deflexo, apice mucronata mucrone 1·5–2 mm. longo demum deciduo, 1·5–1·7 cm. longa, 1·7 mm. lata, integra, plana vel margine paulo incrassato levissime recurvata, costa conspicua, viridia, glabra vel leviter tomentosa, juniora cinereoviridia, pilis patentibus albis 2 mm. longis induta, ad ramorum apices conferta, subsessilia; stipulae lineares, 3–5 mm. longae, fuscae, cum foliis deciduae. *Flores* magni, sicco flavi, terminales, pauci (1–2), inter folia conferta sessiles; bracteola a calyce libera, rubro–fusca, 3–5 mm. longa. *Calyx* pilis albis dense indutus, 6 mm. longus, regulariter 5-fidus, lobis tubum aequantibus. *Vexillum* magnum, obcordatum, 1 cm. diametro, ungue 2·5 mm. longo; alae 1 cm. longae, 3·5 mm. latae auricula 1 mm. longa; carina 1·1 cm. longa, 4·5 mm. lata. *Stamina* basi libera, 0·9–1 cm. longa; filamenta filiformia, basi plus minusve dilatata; antherae versatiles, oblongae, 1 mm. longae. *Ovarium* sessile, dense albo-pilosum; stylus filiformis, 8 mm. longus, stigmate minuto glabro. *Legumen* ovoideum, 9 mm. longum, 4·5 mm. latum, pilis longis albis indutum.

Western Australia. Narrogin Experiment Farm, *Stoward* 64.

825. **Crotalaria** (**Eucrotalaria**) **shanica,** *Lace* [Leguminosae-Genisteae]; a *C. striata*, DC., racemo gracili, floribus insigniter distantibus recedit.

Herba sarmentosa, caulibus gracilibus simplicibus vel ramosis mox parum sulcatis fere glabris. *Folia* trifoliolata, petiolo 2·5–5 cm. longo supra canaliculato tenuiter puberulo suffulta; stipulae deciduae, minutae, lanceolatae; foliola obovata, apice acuminata, acuta, mucronulata, basi cuneata, terminali lateralibus parum majore, usque ad 5·5 cm. longa et 3·2 cm. lata, membranacea, supra glabra, infra pilis albis adpressis hic illic instructa, nervis inter se distantibus utrinque conspicuis, integra, petiolulis usque ad 2 mm. longis brunneo-pubescentibus suffulta. *Racemi* foliis oppositi, simplices, laxiflori, 12–20 cm. longi, pedunculo

communi usque ad 3 cm. longo suffulti; pedicelli graciles, 5–6 mm. longi, bracteolis duabus minutis circiter medium instructi; bracteae angustae, usque ad 3·5 mm. longae. *Calycis* lobi inter se subaequales, oblongo-lanceolati, acuti, 6 mm. longi, 2 mm. lati, parum puberuli. *Corolla* lutea; vexillum orbiculare, circiter 1 cm. diametro, glabrum, venis notatum, ungui brevi breviter densius piloso; alae oblongae, circiter 8 mm. longae et 4 mm. latae, ungui circiter 1·5 mm. longo; carina 8 mm. longa, 5 mm. lata, ungui 1 mm. longo. *Stamina* generis, filamentorum tubo circiter 2·5 mm. longo. *Ovarium* sessile, glabrum, multi-ovulatum; stylus 8 mm. longus, superne longitudinaliter barbatus. *Legumen* (vix maturum) oblongum, apice rotundatum, 2 cm. longum, 6 mm. diametro, glabrum, calyce styloque persistentibus.

INDO-CHINA. Upper Burma: Gokteik, 700 m., *Lace* 5447.

826. **Sempervivum ciliosum**, *Craib* [Crassulaceae]; ab affini *S. Braunii*, Funck ex Koch, rosulis multo densioribus apice fere planis, foliorum pilis conspicue longioribus facile distinguendum.

Rosulae steriles apice magis minusve planae, usque ad 3 cm. diametro; folia conferta, oblongo-oblanceolata, plus minusve acuminata, obtusiuscula, usque ad 1·7 cm. longa et 4 mm. lata, dorso superne carinata, apicem versus pilis longis albis conspicue ciliata dorsoque superne pilis similibus instructa, intra brevius pubescentia, exteriora apice rubro-suffusa, interiora omnino viridia. *Caulis* floriferus circiter 5 cm. altus, undique pilis glanduloso-capitatis instructus, foliis imbricatis apice rubro-suffusis ornatus, flores circa 6 subsessiles gerens; bracteae parvae, angustae. *Calycis* lobi oblongo-lanceolati, acuti, 3 mm. longi, 1·5 mm. lati, satis carnosi, dorso glanduloso-pubescentes. *Corolla* 2·3 cm. diametro; petala 9–11, linearia, 8·5 mm. longa, 1·75 mm. lata, pallide viridia, dorso margineque glanduloso-pubescentia. *Stamina* circiter 5 mm. longa, filamentis pallidis inferne breviter glanduloso-pubescentibus, antheris luteis. *Squamae* hypogynae, parvae, pallidae. *Carpella* staminibus subaequialta, breviter parcius glanduloso-pubescentia, stylis erectis.

Described from a plant which flowered at Kew in the middle of October of the present year. A flowering specimen was also received from Cambridge Botanic Gardens in October, 1913.

827. **Ilex Englishii**, *Lace* [Ilicaceae]; ab. *I. macrophylla*, Wall., foliis vix acuminatis nervisque lateralibus paucioribus et ab *I. cochinchinensi*, Lour., nervis lateralibus supra haud omnino obscuris, foliis infra haud reticulatis distinguenda.

Frutex grandis vel arbuscula, sempervirens, ramulis magis minusve angulatis primo minute puberulis mox glabris cortice cinereo-albo obtectis. *Folia* oblonga, elliptico-oblonga vel oblanceolato-oblonga, apice acuta vel interdum rotundata, basi cuneata vel late cuneata, 5–11 cm. longa, 2–4·5 cm. lata, coriacea, glabra, supra nitida, infra pallidiora, costa supra impresea infra valde prominente, nervis lateralibus utrinque 10–14 haud obscuris mox pagina superiore leviter impressis inferiore prominentibus, margine integro parum recurvo; petioli 0·5–1·5 cm. longi, supra canaliculati, primo minute puberuli, demum glabri; stipulae

minutae, puberulae. *Inflorescentiae* masculae axillares, e cymis umbelliformibus solitariis vel racemosim dispositis constitutae, pedunculo communi usque ad 1·3 cm. longo simul ac ramulis juvenilibus pedicellis bracteisque puberulo suffultae; pedicelli ad 3 mm. longi; bracteae bracteolaeque minutae. *Calyx* circiter 3 mm. diametro, dorso puberulus; lobi 5–6, acuti, tubo subaequilongi, ciliolati. *Corolla* glabra, circiter 5 mm. diametro, lobis basi breviter connatis. *Filamenta* 1·5 mm. longa. *Inflorescentiae* femineae masculis similes nisi breviores et e floribus paucioribus constitutae. *Calyx corollaque* maris. *Stigma* globosum, sessile. *Fructus* (an maturus?) depresso-globosus, 3–4 mm. diametro, fuscus, stigmate calyceque persistentibus.

Indo-China. Upper Burma: Maymyo Plateau, 1050 m., *Lace* 6164 (type), 5283, *English* 30.

To this species should probably also be referred *Lace* 6155, collected in the same place, which differs in its larger leaves and rather larger flowers.

828. **Ipomoea maymyensis,** *Lace* [Convolvulaceae—Colvolvuleae]; ab *I. popahense*, Coll. et Hemsl., foliis brevioribus multo latioribus et ab *I. siamense*, Craib, foliis basi haud cordatis inter alia facile distinguenda.

Herba volubilis; caules graciles, setosi. *Folia* ovato-lanceolata lateve lanceolata, apice acuta, basi rotundata vel rarius rotundato-cuneata, 7–11·5 cm. longa, 2·5–4·3 cm. lata, chartaceo-membranacea, utrinque pilis longiusculis subrigidis albidis adpressis basi tuberculatis instructa, infra pallidiora, nervis lateralibus utrinque 6–8 pagina utraque conspicuis, nervulis infra subconspicuis, integra, ciliata; petioli usque ad 2·5 cm. longi, indumento simul ac caules instructi. *Pedunculi* axillares, solitarii, fere 2·5 cm. longi, 1–3-flori, indumento ut caules; bracteae lineares, usque ad 2 cm. longae, pilis longis pallide brunneis divaricatis instructae; bracteolae bracteis similes nisi minores. *Sepala* 5, e basi oblonga longissime acuminata, fere 2 cm. longa, basi 4 mm. lata, intus glabra, dorso pilis iis bractearum similibus instructa. *Corolla* 4 cm. longa, glabra, parte basali tubulosa circiter 6 mm. longa. *Filamenta* 1·1 cm. longa, ima basi pilosa; antherae 5·5 mm. longae, augustae. *Ovarium* glabrum; stylus filiformis, 2·3 cm. longus, glaber.

Indo-China. Burma: Maymyo Plateau, 1050 m., *Lace* 5942.

829. **Edgeworthia longipes,** *Lace* [Thymelaeaceae—Euthymeleae]; ab *E. Gardneri*, Meissn., capitulo longe pedunculato facile distinguenda.

Frutex vel *arbuscula*, ramulis teretibus juventute pilis brevibus arcte adpressis instructis mox glabris cortice rubro-brunneo reticulato-striato obtectis. *Folia* alterna, oblanceolata lateve oblanceolata, apice subito breviter acutissime acuminata, basi in petiolum brevem vel brevissimum gradatim attenuata, usque ad 16·5 cm. longa et 4 cm. lata, membranaceo-papyracea, pagina superiore fere glabra, inferiore pallide viridia, pilis brevibus albis adpressis paucis praesertim ad costam instructa, margine saepe parum recurva, nervis lateralibus utrinque 10–13 supra conspicuis

infra prominulis. *Capitula* multiflora, circiter 4 cm. diametro, basi bractea solitaria vel bracteis geminis caducis foliis similibus sed his minoribus instructa, pedunculo folio opposito 9–11 cm. longo superne incrassato sulcato indumento simul ac ramulis suffulta. *Perianthii* tubus cylindricus, 1·5–2 cm. longus, extra sericeus, intus glaber; lobi 4, acute acuminati, 5–6 mm. longi, vivi lutei. *Stamina* 8, biseratim disposita, serie superiore ad tubi orem inserta antheris paulo exsertis, serie inferiore 3–5 mm. infra superiorem sita. *Ovarium* sessile, apice pilis longis albis erectis dense tectum, stylo superne glabro.

Indo-China. Upper Burma: Ruby Mine District; Mogôk to Bernardmyo, 1500 m., *Lace* 6005.

830. **Acalypha Lacei,** *Hutchinson* [Euphorbiaceae—Crotoneae]; affinis *A. Kerrii,* Craib, sed foliis crenato-dentatis nec serratis infra in nervis solis patule pilosis, bracteis florum ♀ dentato-lobatis differt.

Frutex; ramuli albescentes, subflexuosi, minutissime puberuli; internodii 1–2 cm. longi. *Folia* petiolata, late ovata, caudato-acuminata, basi rotundata, 5·5–12 cm. longa, 4–8 cm. lata, paullo crenato-dentata, dentibus oblique triangularibus subacutis, membranacea, sicco pallide brunnea, supra minute verrucosa et parce setosa vel fere glabra, infra in nervis et venulis patule pilosa, basi 5–vel sub–7–nervia, nervis lateralibus utrinque 4–5 arcuatis prominentibus intra marginem anastomosantibus, venis laxe reticulatis infra prominulis; petioli 1–5·5 cm. longi 1–1·5 mm. crassi, supra late canaliculati, infra sulcati, parce pubescentes; stipulae lineari-lanceolatae, acutae, 4–5 mm. longae, tomentellae. *Inflorescentiae* axillares, bisexuales, gracillimae, usque ad 6 cm. longae, floribus inferioribus feminibus 1–2 ceteris masculis; axis tomentellus. *Glomeruli* florum ♂ laxe dispositi. *Sepala* parce puberula. *Bractea* floris ♀ ambitu semiorbicularis, 4–5 mm. lata, 5–dentato-lobata, utrinque parce puberula, dentibus triangularibus subacutis. *Sepala* 3, ovato-orbicularia, obtusa, 1 mm. longa, 0·75 mm. lata, subcoriacea, extra superne et margine pubescentia, intra glabra. *Ovarium* setosum; styli liberi, 3 mm. longi, laciniati. *Fructus* non visus.

Burma. Upper Chindwin District; opposite Kindat, 160 m., Aug., *Lace* 4232.

LXXI.—GARDEN NOTES ON NEW TREES AND SHRUBS.*

W. J. Bean.

xviii. (*cont.*)—NEW RHODODENDRONS.†

Rhododendron adenopodum, *Franchet.*

The well-known French missionary, the Abbé Farges, appears to have first discovered this interesting and distinct rhododendron. In a letter to Kew, Mr. Maurice L. de Vilmorin, of Les Barres, informs us that he received seeds from the Abbé in 1901, collected in Eastern Szechuen. A plant raised from them flowered with Mr. de Vilmorin in 1909. It is very distinct among rhododendrons in its oblanceolate leaves, clothed beneath with a dense, brownish-white felt. On the plant at Kew (introduced by Wilson from Western Hupeh in 1904) the leaves are sometimes 6 in. long, but only about $1\frac{5}{8}$ in. wide; smaller ones are 3 in. long by $\frac{1}{2}$ in. wide. The flowers are produced, four to six together, in a loose truss. Corolla broadly campanulate, 3 in. wide, five-lobed, pale rose; calyx-lobes $\frac{1}{8}$ in. long, oblong, ciliate; stamens ten, pubescent at the base of the filaments; pedicels and fruits hairy.

Mr. de Vilmorin compares the flowers to those of the hybrid *R. kewense*; the resemblance is seen in the loose truss, the widely-open corolla, and in its delicate rose colour. The bush grows as much as 10 ft. high; it is apparently quite hardy and a good grower.

Rhododendron argyrophyllum, *Franchet.*

According to Mr. E. H. Wilson, who introduced this species to cultivation about 1904, it is one of the commonest rhododendrons in Western Szechuen, China. It is found there up to 20 ft. in height. The young shoots in the typical form are clothed with a loose scurf, but in some forms are glabrous or very soon become so. Leaves oblong-lanceolate, cuneate to rounded at the base, 3 to 6 in. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. wide, glabrous above, clothed beneath with a close, compact felt; petiole about $\frac{1}{2}$ in. long. The flowers are borne in a loose truss, about ten together; corolla broadly funnel-shaped, $1\frac{1}{2}$ in. in diameter, shallowly five-lobed, white or slightly tinged with pink, with deeper pink spots on the upper side. The calyx is small, its lobes triangular; stamens twelve to fourteen, shorter than the corolla, the filaments pubescent towards the base; ovary pubescent; style glabrous; fruit about 1 in. long, slightly pubescent.

The species was originally discovered by the Abbé David, about 1885. It appears to be quite hardy, but grows slowly.

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* **Ribes wollense.**—Since the description under this name of the shrubs growing at the Woll, Hawick, N.B., appeared in these pages (*K. B.*, 1914, p. 49), fresh flowers and further material have been examined. It now appears certain that the shrubs in question are not of hybrid origin, but belong to *Ribes divaricatum*, Douglas. The name *wollense* must therefore disappear. The plate also needs correction, and should read *Ribes divaricatum*.

† See p. 201.

Rhododendron calophytum, *Franchet.*

One of the most interesting things respecting some of the newly discovered rhododendrons of Western China is that they have made available to planters situated in the average climate of the British Isles several tree-like types, rivalling in stature and nobleness of foliage, those North Indian species, only hardy in our mildest counties. Most notable, perhaps, in this respect is *R. calophytum*, which Wilson found 50 ft. high in the forests of Western Szechuen, and of larger size than any other species native of that region. The largest leaves on adult trees are about 12 in. long and 3 in. wide, obovate to oblanceolate, acute at the apex, narrowly cuneate at the base; they soon become quite glabrous. Flowers in loose trusses, the corolla seven- or eight-lobed, campanulate, 2 in. wide, of some shade of pink. Wilson remarks that the scarlet pedicels add much to the beauty of the inflorescence. The stamens are glabrous, shorter than the corolla, sixteen or more in number.

Originally discovered by the Abbé David in Thibet, this species was first introduced to the Coombe Wood nursery in 1904. It is apparently very hardy at Kew.

Rhododendron Davidii, *Franchet.*

This species belongs to the fine group of rhododendrons whose leaves are quite glabrous and the corolla seven- to nine-lobed. This group includes *R. discolor*, *Fargesii*, *decorum*, *Fortunei*, *rotundifolium*, and others. *R. Davidii* was discovered by the Abbé David, after whom it was named, about 1885, and was introduced by Mr. E. H. Wilson to the Coombe Wood nursery in 1904. It is a bush eventually becoming 12 ft. high, its young shoots quite glabrous. Leaves oval-oblong, rounded to broadly cuneate at the base, mucronate, 3 to 6 in. long, $\frac{3}{4}$ to 2 in. wide, dull yellowish green above, rather glaucous beneath. Flowers borne ten or more together in a terminal raceme as much as 6 in. in length. Corolla campanulate, about 2 in. wide, seven-lobed, pale purple spotted on the upper side. The calyx has rounded, ciliate-glandular lobes; stamens fourteen, with glabrous filaments; ovary glandular; pedicels more or less glandular.

R. Davidii has flowered at Kew several times during the last two or three years, usually in April. In its group it is distinct in the elongated common-stalk of the inflorescence.

Rhododendron discolor, *Franchet.*

For a long time the only true evergreen rhododendron (as distinct from Azalea) known in China was *R. Fortunei*, introduced by Fortune in 1859. Later discoveries made farther west have shown that this species may be regarded as the type of a well-marked group with large, smooth leaves, a six- or seven-lobed corolla, and twelve to sixteen stamens. To this group *R. discolor* belongs. It is a vigorous plant and was found by Wilson in Western Hupeh, sometimes 20 feet high. Its oblong leaves are 8 in. long and $2\frac{1}{2}$ in. wide (considerably larger on young unflowered seedlings); petiole purple, stout, up to $1\frac{1}{4}$ in. long. From the leaves of *R. Fortunei* they are well distinguished by having a cuneate instead of cordate base. The flowers have not yet appeared

on plants at Kew, but one blossomed at Coombe Wood in June, 1911. They are white tinged with pink or sometimes distinctly rosy pink, the funnel-shaped corolla being $2\frac{1}{2}$ to 3 in. wide and six or seven-lobed. Stamens twelve or fourteen; the filaments glabrous, shorter than the corolla. Ovary and style glandular. Another distinction from *R. Fortunei* is provided by the ciliate margins of the calyx.

Wilson first introduced *R. discolor* from Szechuen in 1900 for Messrs. Veitch, who presented plants to Kew in 1908. Since then the same collector has sent large quantities of seed from Hupeh, so that this fine species is likely to become well represented in gardens.

Rhododendron Faberi, *Hemsley.*

Originally described by Dr. Hemsley in the *Journal of the Linnaean Society* in 1889 (vol. xxvi. p. 22) from specimens collected by the Rev. E. Faber on Mt. Omi in Western Szechuen, this distinct species was first introduced in 1904 by Wilson from the same locality. According to the collectors, it attains a height of about 20 feet in a wild state. The young shoots are covered with a brown, rather loose felt. The leaves are of hard, stiff texture, ovate-oblong to oval, 3 to 8 in. long, 1 to 4 in. wide; they are glossy dark green and glabrous above and the lower surface is usually clothed at first with a ferrugineous tomentum, which gradually becomes reduced to patches near the midrib; sometimes they are almost glabrous on both sides by autumn; petiole $\frac{1}{2}$ to 1 in. long, brown-felted. The flowers are produced, six to twelve together, in trusses 3 in. wide. Corolla campanulate, $1\frac{1}{2}$ to 2 in. wide and, according to Wilson, white or white spotted with red. Stamens shorter than the corolla, filaments hairy at the base; ovary and lower part of style glandular. The calyx is distinct in its large oblong or ovate, glandular-ciliate lobes, sometimes $\frac{1}{2}$ in. long.

Living plants of *R. Faberi* are sturdy, healthy looking, and distinct in the large, stiff leaves with a yellow midrib; but the species has not yet flowered at Kew.

Rhododendron longesquamatum, *C. K. Schneider.* (*R. Brettii*, Hemsley and Wilson.)

A bush sometimes approaching 20 feet in height, its young shoots thickly clothed with a curly, brownish red wool which extends also up the petiole and midrib of the leaf. Leaves up to $5\frac{1}{2}$ in. long by 2 in. wide, obovate to oblong, pointed, rounded or slightly cordate at the base; except for the shaggy midrib they are glabrous. Flowers twelve or more in a truss; the corolla $2\frac{1}{2}$ in. wide, five-lobed, open campanulate, pink with a dark red blotch. Stamens ten, shorter than the corolla, filaments pubescent towards the base. The calyx is very characteristic, being very deeply five-lobed, the lobes oblong-lanceolate, $\frac{1}{2}$ in. in length, glandular and hairy. The calyx, together with the shaggy branchlets and midrib, make this species very distinct.

Discovered by Wilson near Tatien-lu, Szechuen, in 1903, and introduced by him to the Coombe Wood nursery. It appears to be quite hardy but slow-growing.

Rhododendron pachytrichum, *Franchet.*

This is a shrub or small tree originally discovered by the Abbé David and introduced in 1903 from Western China by Mr. E. H. Wilson, who found it as much as 20 feet high. From the older hardy rhododendrons it is well distinguished by the thick coat of pale brown, curly bristles that clothe the young shoots, petioles, and under surface of the midrib. The leaves vary from narrowly oblong to obovate and are 3 to 6 in. long, 1 to 2 in. wide, often cuspidate at the apex, rounded to cuneate at the base, glabrous above, the margins at first ciliate; petiole $\frac{1}{3}$ to 1 in. long. I do not know that flowers have yet been produced in this country; possibly they have been in some of the gardens of the south-west. They are borne in compact trusses 3 or 4 in. across, and are said to vary from white to pale rose. The calyx is small, glabrous, its lobes triangular; corolla campanulate, $1\frac{1}{4}$ in. in diameter; stamens ten, shorter than the corolla, the filaments pubescent at the base; ovary bristly; peduncles $\frac{5}{8}$ in. long, bristly. Seed-vessel 1 in. long, $\frac{1}{4}$ in. wide, slightly bristly.

R. pachytrichum reaches an altitude of 10,000 feet in Western China, and ought therefore to be able to withstand much cold. It has, however, been several times injured by late spring frosts at Kew.

Rhododendronlon Przewalskii, *Maximowicz.*

The famous Russian traveller, Przewalski, first discovered this species in the province of Kansu, W. China, in 1880, and it was introduced to cultivation by way of Petrograd. Wilson found it again, south of Kansu, and introduced it afresh in 1904. He remarks that in those regions it ascends to higher elevations than any other broad-leaved rhododendron, as distinct from the smaller-leaved, lepidote ones. He found it at an altitude of 14,500 feet. As represented in cultivation it is one of the dwarfest and most compact of rhododendrons; in twenty years it is only 2 to 3 feet high, although Wilson appears to have met with it up to 10 feet. Leaves narrowly oval to obovate, 2 to 4 in. long, 1 to $1\frac{3}{4}$ in. wide, cuneate to rounded at the base, acute at the apex, glabrous above, usually scurfy beneath; petiole and midrib yellow, the former $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers white or rosy pink, borne in compact trusses 3 in. wide. Corolla $1\frac{1}{4}$ in. across, broadly funnel-shaped, five-lobed. Stamens ten, the filaments either glabrous or slightly pubescent near the base. The pedicels are about $\frac{1}{2}$ in. long, and, like the small, slightly lobed calyx, the ovary and the style, smooth.

R. Przewalskii is apparently shy-flowering and has not yet blossomed at Kew. Its very close, dwarf habit suggests that it might be useful in the hybridiser's hands in establishing a dwarf race.

Rhododendron strigillosum, *Franchet.*

In its general appearance this rhododendron bears a considerable resemblance to the *R. pachytrichum* previously described. Like that species it is well marked by the bristly character of the young shoots, petioles and other parts. On the shoots the bristles

are $\frac{1}{6}$ in. long, whitish becoming pale brown, usually gland-tipped. Leaves oblong-lanceolate, acuminate, cuneate to slightly auricled at the base, 3 to 6 in. long, $\frac{3}{4}$ to $1\frac{1}{2}$ in. wide, setose beneath, especially on the midrib; petiole $\frac{1}{4}$ to $\frac{5}{8}$ in. long. Flowers borne in trusses 4 in. wide, corolla campanulate, $1\frac{1}{2}$ in. in length and width, rich red in the typical form, but said by Wilson to vary in colour from crimson to white. The stamens are ten, their filaments glabrous. The calyx, peduncle and fruit are all bristly. the last-named $\frac{1}{2}$ to 1 in. long, cylindrical.

R. strigillosum is evidently closely allied to *R. pachytrichum*, but its leaves are of different shape and more hairy beneath, and the glabrous filaments give a ready distinction. It was discovered by David and named as long ago as 1886, but was introduced about ten years ago by Wilson. Like *R. pachytrichum* it is liable to have its young shoots injured by late spring frosts. We shall probably see it at its best in the Cornish gardens.

LXXII.—ENCEPHALARTOS HILDEBRANDTII.

O. Stapf.

A proposal to publish illustrations of *Encephalartos Hildebrandtii* in the Botanical Magazine has necessitated a revision of the existing material of that plant in the Gardens, Museums and Herbarium at Kew as well as of the relative literature. In the course of the work some new facts worthy of record have come to light with regard to the history of the discovery of the plant, its distribution in East Africa and certain points of physiological interest. To a great exteut they are based on observations recorded in the voluminous correspondence which Sir John Kirk carried on with Sir Joseph Hooker, and with Sir W. T. Thistleton-Dyer, whilst acting as Consul-General in Zanzibar. These observations constitute a valuable contribution to our knowledge of an interesting plant; their publication may serve as one more acknowledgment of Sir John Kirk's work as a keen naturalist, active observer and ever ready friend of Kew.

Discovery and Distribution.—On March 20th, 1868, Kirk announced to Sir Joseph Hooker the discovery of a new *Encephalartos* at Dar es Salam of which he had secured an entire plant. At the same time he sent home some pinnae of a leaf and some seeds. A cone, which was to have been brought home by the Rev. Mr. Wakefield, never reached its destination. The pinnae and the seeds which are still preserved in the Museum were, of course, insufficient for description. In 1870 a "root" followed, but although its receipt is duly recorded, it cannot any longer be traced and probably was found to be dead. Another plant forwarded that year seems to have had the same fate: but seeds received in September, 1870, germinated, and at least one of the plants thus raised is still alive. Long before the plants at Kew were large enough to be described, the species was rediscovered by the German traveller and collector, J. M. Hildebrandt, and was sent to Berlin and subsequently distributed in numerous specimens to various European gardens. The speci-

mens received at Berlin, imperfect as they were, were described at once by Professor Alexander Braun and the Curator of the Berlin Botanic Garden, C. Bouché, and named after Hildebrandt. This was in 1874.* Subsequently when the plants had recovered from the journey and been supplemented by further material, more complete accounts were published by A. Braun† and Professor Eichler.‡ It is not exactly known where Hildebrandt collected his first specimens, and Braun and Bouché merely define the area of the species as covering "the coast of Zanzibar and to the north as far as Mombasa." In 1877 Kirk made a rapid journey to the outer Usambara Hills, opposite the island of Pemba, when he wrote (October 12th) to Sir Joseph Hooker: "The country on the march from the coast to the hills was like the maritime region of East Africa generally, the chief points of interest being the *Pandanus* of a species I do not recognise and the *Encephalartos* I sent you seeds of . . . . I had imagined this *Encephalartos* to be beyond, rather to the mountains. I see at Tanga that it is rather native of the maritime plains, elevation from 200–500 feet only, on coral metamorphic limestone." Hildebrandt had meanwhile made several expeditions to Mombasa, and in his narrative,§ published in 1879, he stated that (in 1876) he found the hills (Jurassic limestone) near Shangamue, that is, between the Durum hills and the Fimboni Valley, about 12 miles N.W. of Mombasa, covered with short grass and Acacias and scattered plants of *Encephalartos Hildebrandtii*. "Their shining stems," he says, "rise to 5 m. The wide spreading, dark green crown of mucronate fronds protects the large fruiting cones, the farinaceous seeds of which serve as food in times of famine." The most striking plant associated with it in that region is the *Borassus* palm, whose columnar trunks attain double the height of the *Encephalartos*. In 1878 Kirk at last succeeded in sending home a male stem in good condition, 1 foot thick and 3 feet long, measuring with its fronds 12 feet. It came from Tanga, or from some point on the coast opposite Pemba. This specimen is still in vigorous health, the stem measuring 1 m. in height and 0·37 m. in diameter, whilst the fronds rise to 2·4 m. above it, being up to 2·25 m. long. At the same time he mentioned having been told of stems as much as 12 to 14 feet high, and in a later letter he speaks of having seen one 20 feet high and of great thickness, adding "it will cost a little to get them here and send them thence. I shall have to hire a native vessel and lower them with ropes, and it will require, I should say, fifteen or twenty men to each one, they are so thick and heavy." This giant he saw when at the north end of the island. Some months later (February, 1879) he returned there, and this is the account he gives of the singular condition under which the *Encephalartos* grows, illustrating it by a photograph of a whole plant in its habitat and another of the male and female cones collected on that

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* Encephalartos Hildebrandtii, A. Braun & Bouché, Ind. Sem. Hort. Berol. (1874) 8.

† A. Braun in Sitz. Ber. Gesellsch. Naturf. Freund., 1876, Oct. 17.

‡ Eichler in Monatschr. Ver. Beförd. Gartenbau, xxiii. (1880) 50.

§ Proceed. Geogr. Soc. xxii. 449, and Engl. Pflanzenwelt Ost.-Afr. I. A. 173.

occasion: "I have returned from visiting the north coast of this island (Zanzibar) with a view to sending to Kew one of the large Cycads (*Encephalartos*) I before told you of. Captain Earl, of H.M.S. "Linden," took me in a steam launch. We saw the trees standing out in the rocky shore, but had difficulty in effecting a landing, although it was at the time calm. The raised coral rock here stands 25 ft. above the sea, and is hollowed out to lean so that only at a chance spot was it possible to climb up, and then we were forced to use ropes. Once on the top it was equally difficult to move along, for near the coast the coral had been corroded into a number of spikes with sharp angles and cavities, into which it would have been most dangerous to slip. Farther inland these hollows were partially filled with red earth, so that it was easier to move about, but to transport a tree even of less size than those we had come in quest of, was clearly impossible with the means at our disposal over such dangerous and impracticable ground. We therefore selected one with a trunk 15 feet high clear of leaves, a male in full flower and with a crown of leaves that raised it 22 feet from the ground. This grew on the edge of the rock, so that we would not have to carry it over the spikes. It was soon found impossible, however, to take it off the roots, as these had filled every crevice of the rock holes. We cut it, therefore, off the rock, securing quite enough to enable it to grow without difficulty. Most unfortunately when the work was almost done it fell and snapped asunder on a rock, one-third from the top. The lower part we, however, took on board, and I have planted it on the chance that it may shoot out, as I saw many old trunks had done. After this we secured with great labour a small plant that had not yet flowered. The stem of this is about 5 feet high. This also I have planted here to give it a better chance of standing the voyage. I took a photo of a female tree 5 feet high in fruit. I have also taken one of the male and female cones which I sent. I also enclose a photo of the male and female cones of the Mombasa plant. The female cone in that is, however, unusually short. I hope the photos will be of some use as a guide. I am not sure that I shall have the full view of the *Encephalartos* in fruit printed in time to send now. It has a very peculiar habit . . . . to that of the other Cycads, and the many fruits set at an angle are peculiar. The *Encephalartos* of the place we went to is singularly limited to those rocks. The country a few hundred yards back is open grass, but there not a specimen is seen. These rocky places contain many peculiar plants besides. I saw *Dorstenia*, an *Impatiens* and other plants, including the *Calumba* root that seemed to stand and enjoy the heat, the drought and the hard limestone rock. When next I go there it must be with better appliances and more time at my disposal. There must be the means of getting a mass of trunk a ton weight, over the sharp rocks without cutting the men." Yet no opportunity for repeating the expedition to those limestone cliffs seems to have arisen, and the *Encephalartos* inhabiting them remained undisturbed. Meanwhile Kirk had planted *Enceph-*

alartos Hildebrandtii in his country garden* on the Island of Zanzibar, with the intention of having a "Cycad avenue," and it was thence, in 1884, that he sent to Kew the fine male and female specimens, from which the two plates, which are shortly to appear in the Botanical Magazine, were prepared. The correspondence on *Encephalartos Hildebrandtii* ceased with the letters advising the despatch of those stems.

Since then *Encephalartos Hildebrandtii* has been found to extend in Usambara as far inland as the upper Bombo Valley (45 miles from Tanga), so that Dr. Kirk's original surmise that it should extend "beyond rather to the mountains" was after all justified. Here, as well as in the drier parts of the littoral, it is associated with the candelabra-like *Euphorbia Nyikae*, *Sansevieria guineensis*, and an unnamed *Aloe*. Other recent records are from Rossako,† about 17 miles west of Bagamoyo and from the west coast of Zanzibar Island. Werth‡ alludes to it as a characteristic element of the bush formation of the young coral land of Zanzibar Island, "nowhere appearing in masses, but always in scattered individuals or small groups, in a short stem bearing wide dense crowns of spinous fronds." The area of this Cycad is therefore, as far as we know at present, confined to a narrow belt on the coast of East Africa, extending over about 200 miles from Dar es Salam to Mombasa. Within this belt the ground should be mostly limestone, either Jurassic or of young coral formations, and only where the belt attains to its greatest width, namely, in Usambara, would it be formed by gneiss or crystalline schists.

Generation of Heat in the Male Cones.—The fact that heat is generated in the male cones of certain cycads has been known for a long time. Teysman observed it in *Cycas circinalis* in 1849§ and Jul. Poisson in *Dioon edule* in 1878.‖ Subsequently extensive and accurate records were obtained in 1894 by Professor Gregor Kraus¶ from *Ceratozamia longifolia* and *Macrozamia Miquelii* in Buitenzorg. In this connection it is interesting to note that Kirk had also observed the same phenomenon in *Encephalartos Hildebrandtii* in 1878, recording on one occasion a rise of temperature

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* Sir John Kirk, to whom we have submitted this article, sends us the following letter with reference especially to his garden at Zanzibar:—

December 7th, 1914.

"It seems strange to go back and find extracts from my letters of many years ago still of use. I was not aware that Sir Joseph Hooker had kept my correspondence. I wish I had preserved the many letters he wrote me but papers soon get lost in the tropics amongst the many other interests that had to be attended to . . . In my experimental garden on the Island of Zanzibar . . . I had a wonderful collection of shrubs, trees and flowering plants which I acquired in exchange from many sources, India, Australia, as well as from England, and to this day that garden covering 40 acres still remains and the lofty Eucalyptus trees of several species, including the *citriodora*, the Mahogany tree, the Para and Ceara rubbers, the Brazil nut, etc., and all that flourish well are well cared for by Miss Thackeray who took the place over from me."

† Stuhlmann, Mit Emin Pascha, p. 824.
‡ Werth, Die Vegetation d. Insel Sansibar (Diss. 1901) 49.
§ Nederl. Kruidkund. Archief. i. (1850) pp. 109-114; ii. (1851) pp. 183-184.
‖ Bull. Soc. Bot. France, xxv. (1878) pp. 253-254.
¶ Annal. du Jard. Bot. Buitenzorg, xiii. (1896) pp. 217-251.

of as much as 16·5° F. (9·15° C.). This is what he said in writing to Kew on January 6th and 31st:—

January 6th.—"I have in my garden a plant of *Encephalartos Hildebrandtii* now in male cone. There are six cones close together in the crown, and last night when walking home with two in my hand, I noticed a strange fact worth noting and following up, both in this and other species. The cones were in paper—I had them in a bag, the sun had set, and there was nothing to disturb the temperature, but on taking them out to show some friends at home, I found them very hot. I placed them in a cloth with a thermometer that reached outside; the air was then 81·5°, and soon the cones rose to 98°, being 16·5° above the air. I left them there all night, and although they had been at an open window and exposed to the night air, they still were 6° above the air, which was 80°, while the cones showed 86°. They were then perfecting the pollen, which fell from the scales when shaken. I must try this on the cones when still on the plant, for those I observed with had been separated, but I doubt not this is a remarkable instance of heat generated as in arums at the time of forming the pollen. I have a male *Cycas* now coming on, and shall try it in that also.

January 31st.—"I have, since writing on the 6th inst., verified my observations on the temperature of the male cones of *Encephalartos Hildebrandtii*. The temperature is highest as the pollen is being matured and when the first can be shaken out. I have also made a practical experiment on the large male cone of our *Cycas* sp. Unluckily it has been brought to me when ripening the pollen, so that I have only an indication that the same phenomenon will be found in it. The rise of temperature was distinct. I have been very careful to avoid all chance of error, and this is rendered impossible by the small mass of the cone of *Encephalartos*, which could not retain solar heat inside and show as if it had originated heat. Besides, in the last stage of my experiment, there had been no sun all day, and the cone was quite cold and rose to its high temperature. I daresay all this is well known to you, but I have few works of reference here."

Encephalartos Hildebrandtii and E. villosus. Shortly after the publication of the first description of *Encephalartos Hildebrandtii* by A. Braun and Bouché, the validity of the species was questioned by E. Regel,* and its identity with Lehmann's *E. villosus*, a native of Natal, suggested. No reasons for this reduction were then stated, beyond that "the fronds of more luxuriant specimens seen at Berlin, Cologne and Brussels pass into those of *E. villosus*." A. Braun replied to E. Regel's criticism the same year,† pointing out the differences in the vegetative structure and in the female cones. According to him the stems of *E. villosus* are relatively stouter than those of *E. Hildebrandtii*, the petioles are thrown off earlier, so that the trunk appears armed by their persistent bases close up to the crown, the leaves are less hard and pungent, the teeth of the pinnae (4–9 on

* In Gartenflora (1876), p. 204.

† A. Braun in Sitz. Ber. Gesellsch. Naturf. Freund. (1876), pp. 118-123.

each side, most frequently 5–6) more numerous, more distant near the base and more approximate towards the apex, pointing straight forward or spreading at a very acute angle. The head of the female scales, that is the portion of the scale which alone is visible in the entire cone and forms its surface, is in *E. Hildebrandtii* rhombic in outline, comparable to the apophysis of a cone scale of *Pinus*, sect. *Pinea*, with the hexagonal umbo rather lower down than in the conifer, whilst in *E. villosus* it is, although also rhombic, quite destitute of an "umbo"; to this may be added that in *E. Hildebrandtii* straight ridges radiate from the points of the umbo, whilst in *E. villosus* a downward curving transverse line divides the apophysis into a convex large upper field, lying in the plain of the surface of the cone and a smaller lower field sharply receding towards the axis; this line is, moreover, produced into a cartilaginous, toothed crest. A few years later Braun's differentiation was confirmed by Eichler,* who was able to study the structure of the female cone on living material, one of the specimens received from Hildebrandt having at last produced flowers. Since then the two species have once more been declared by P. Hennings† to be identical. Hennings had observed in a nursery near Berlin a flowering female specimen of an Encephalartos which had been grown for years as *E. villosus* and appeared to be an intermediate between this and *E. Hildebrandtii*. According to Hennings, the intermediate character manifested itself in the pinnae, as well as in the cone scales. To illustrate his view he figures one pinna of typical *E. villosus*, one of the intermediate form and a number of pinnae of *E. Hildebrandtii*. This, however, seems hardly convincing, when regard is had to the circumstance that each frond possesses well over 100 pinnae, which not only vary according to the age and the vigour of the plant, but vary also within the same frond, according to their position on the common rhachis. This being so, it is not difficult to pick out pinnae, which in shape are intermediate between those described as typical for either species. But taking the fronds as a whole, as they are represented by a number of living plants and of dried samples at Kew, I should say that A. Braun's differentiation is quite correct, except in so far as it relates to the leaves of young plants of *E. Hildebrandtii*—I have in mind a leaf of a ten-year-old plant raised from seed communicated by Dr. Kirk, which seems to resemble that of *E. villosus*, particularly in the shape, orientation and arrangement of the teeth. But placing adult plants side by side, there should be no difficulty in distinguishing the two species, even in the absence of female cones. In *E. Hildebrandtii* the fronds are borne on a cylindric, often much elongated stem, they are very rigid, their wool disappears early or is from the outset only moderately copious, their pinnae are very firm, those of the middle or just above the middle of the front are about 9–10 times as long as wide, the teeth usually are 3–4 in number on each side, are rigid, somewhat spreading with the uppermost usually distant from the apex. In *E. villosus*, on the other hand, the

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* Eichler in Monatschrift. d. Verein. z. Beförd. d. Gartenbau. xxiii. (1880), pp. 50-54, tab. 1.

† Hennings in Gartenflora, xxxix. (1890), pp. 234-238, with Abbild. 55.

fronds are borne on a short subglobose trunk, they are less rigid than in *E. Hildebrandtii*, their wool is more copious and persists longer, their pinnae are thinner, those of the middle of the frond are about 13 -15 times as long as broad, the teeth are usually 4 in number on each side, with the upper ones close to the apex or they are almost absent, they are less rigid than in *E. Hildebrandtii*, and distinctly directed forward so as to be often parallel to the midrib of the pinna. As to the female cones the differences, as far as I can judge from the dried and spirit material at Kew and from drawings and photographs made at different times, are quite conspicuous and constant. It is true the toothing and crenulation of the transverse ridge of the apophysis of *E. villosus* may be obscure in some scales and the convex portion above this ridge may become flattened where it rises highest, the head of the scale assuming the shape figured by Hennings l.c. Abb. 55, fig. 2a; but these modifications are confined to the portions of the cone near one or the other end (the scale figured by Hennings was taken from the upper part) where the scales are generally reduced, or so modified as to lose somewhat of their characteristic appearance. In any case such flattened scales of *E. villosus*, with their entire transverse ridge, are still very different from those of *E. Hildebrandtii* with their polygonal umbo and the straight ridges radiating out from its corners, a character not sufficiently emphasized by Hennings' fig. 1.

It may finally be added that the male and female cones of *E. Hildebrandtii* vary considerably in size, and especially in length, and the male occasionally also in colour, so much so that Dr. Kirk was for some time doubtful whether there were not two species on the East coast of Africa; but in the end he came to the conclusion that this was not so, and the examination of the Kew material certainly supports this view. Both suspected forms are represented by living males at Kew, one producing cones up to 42 cm. by 10 cm. with greenish-brown apophyses and pale brick-red claws, the other bearing cones not much over 20 cm. long and 6 cm. in diameter and brick-red all over. Apart from these dimensions and colour differences, there is nothing in the plants to allow of discrimination.

LXXIII.—MISCELLANEOUS NOTES.

Mr. R. A. Rolfe, A.L.S., an Assistant, Second Class, in the Royal Botanic Gardens, Kew, has been promoted to the grade of Assistant, First Class, with effect from November 6th.

Mordecai Cubitt Cooke.—It is with sincere regret that we have to announce the death, in his ninetieth year, of Dr. M. C. Cooke. Dr. Cooke had charge of the Lower Cryptogams in the Herbarium from 1880 till 1892, during which time he completely re-arranged the fungi, incorporated large collections, and published the most important of his works, "Illustrations of British Fungi." Extraordinarily industrious he accomplished during his long life an

enormous amount of work. He retained, long after his retirement, a keen interest in fungi, but of late years his eyesight failed, and a few months ago he left his old home at Kentish Town to live with a married daughter at Southsea. Here he passed away on November 12th.

An account of Cooke's life and scientific work will be found in the *Kew Bulletin* for 1912 p. 369. A. D. C.

Sir Joseph Dalton Hooker.—We learn that a Wedgwood medallion portrait of Sir Joseph Hooker has been placed in the Hall of the American Philosophical Society at Philadelphia, and that it was unveiled by Dr. W. G. Farlow at the meeting of the society held on April 25th last.

We have also received from Lady Hooker the following letter written from the Ito Botanical Institute, Tokyo, on September 19th, 1914:—

Dear Madam,

I have the honour of sending you a copy of the latest number of the "Gakusei" (The Student, Vol. v. No. 16, Sept. 1914), in which you will find a short sketch of the biography of your illustrious husband—the late Sir Joseph Dalton Hooker. Sir Joseph has been recently selected by the contemporaries in Japan as one of the Twenty-Nine Heroes of the World that Modern Time has produced. That essay is, I am glad to tell you, the first detailed account of the life of the great botanist hitherto published in Japanese language. We thank you for the beautiful portrait of your illustrious husband, of which you were so kind as to send me some time ago and with which my essay is duly embellished. That portrait always recalls me the likeness of that of my old grandfather, the late Baron Keisuke Ito, the founder of modern botany in Japan, who died some years ago at the age of ninety-nine.

With best wishes of your good health,

I remain,

Yours respectfully,

Tokutaro Ito.

Lady Hooker,
The Camp,
Sunningdale.

Mr. Chamberlain and Kew.—The following note by Sir W. T. Thiselton-Dyer has been published in the Gardeners' Chronicle. It explains more precisely the occurrence which is described in a note by Mr. Austen Chamberlain published in *K. B.* 1914, p. 298:—

"Mr. Austen Chamberlain is not quite accurately informed as to the history of the completion of the Temperate House at Kew. Mr. Chamberlain wished to see this accomplished, and Kew wanted to extend its cultivation under glass. The moment seemed favourable and I addressed a memorandum on the subject in the

usual way to the Office of Works. The First Commissioner (now Lord Gladstone) approved the proposal, and caused an estimate for the erection of the South Wing to be included in the next year's estimates and submitted to the Treasury. It was agreed to in principle, but at the last moment the item was struck out by the Chancellor of the Exchequer, and the Office of Works informed me accordingly. I did not regard this as an abandonment of the project, but only a temporary postponement such as is not infrequent on financial grounds in official work, even in cases of necessity. Nor did I make any appeal to Mr. Chamberlain: that would have been quite irregular in a matter in the hands of a Minister of the Crown. Mr. Chamberlain acted independently and happening to dine at the House of Commons with the Chancellor of the Exchequer induced him to reverse his decision. The First Commissioner was dining at another table, and Sir William Harcourt authorised him verbally to have the work proceeded with at once. A supplementary estimate supplied the necessary funds."

Kew and the War.—Since the publication of the figures giving the number of the members of the Kew staff serving with His Majesty's forces on land and sea, seventeen more men have volunteered their services or have been summoned as members of the National Reserve.

Three National Reservists, belonging to the uniformed section, have been called out, six ex-soldiers, three being from the uniformed section and three from the labour force, have rejoined the ranks, and ten young gardeners and the packer have enlisted either in the New Army, the Territorial Force or the Naval Reserve.

The total number of men from the Royal Botanic Gardens now serving with the forces is thus sixty-six.

Botanical Magazine for December.—The plants figured are *Clematis Armandi*, Franch. (t. 8587); *Pleione pogonioides*, Rolfe (t. 8588); *Crataegus pubescens*, Steud., forma *stipulacea*, Stapf (t. 8589); *Salvia longistyla*, Benth. (t. 8590), and *Ceratostigma Willmottianum*, Stapf (t. 8591).

The volume for the year which concludes with this number of the Botanical Magazine is dedicated—"To Professor Henry Harold Welch Pearson, M.A., Sc.D., F.L.S. Harry Bolus Professor of Botany, Cape Town, and Director of the National Botanic Garden of South Africa, as successful in his leadership of botanical expeditions as he has been generous in distributing their fruits."

The *Clematis* is a vigorous and handsome species for the introduction of which we are indebted to Messrs. James Veitch & Sons through their collector, Mr. E. H. Wilson. It is rather widely distributed in China, occurring in Hupeh, Szechuan and Yunnan, at altitudes ranging up to 5500 ft. above sea-level. Two forms are in cultivation, and the finer of these is the subject of the illustration, which was prepared from material supplied from the garden

of Sir William T. Thiselton-Dyer, at The Ferns, Witcombe, Gloucester, where the plant made a fine display in April. It is a hardy evergreen climber, with large leathery trifoliate leaves, and showy axillary cymes of white fragrant flowers. It is allied to *C. Meyeniana*, Walp., from which it may be easily distinguished by the presence of a rosette of scales at the base of the inflorescences.

The pretty *Pleione pogonioides* was originally described in 1896 under the name of *Coelogyne pogonioides*, Rolfe. It was first collected by Mr. T. Bullock in the province of An-Hwei and afterwards by Mr. Augustine Henry on mountains near Patung in Hupeh. Living plants, which do not appear to have flowered, were sent to Messrs. Veitch by Mr. Wilson. Bulbs were received from China in 1912 by Messrs. Charlesworth & Co., of Haywards Heath, and the first flowers were produced in February, 1914, when material was sent to Kew for identification and was used in the preparation of the figure. This species and *P. yunnanensis*, Rolfe, figured at t. 8106 of the Botanical Magazine, are the only Chinese Pleiones in cultivation.

The *Crataegus*, represented in the illustration by a form in which the leaves and stipules are larger than is usual in the species, is the well-known Mexican Hawthorn or Tejocote, which is valued, especially by the Indians of Mexico, for its fruits, of which a national conserve is made. It has a long history, being mentioned in the writings of Hernandez, who lived in Mexico between 1571 and 1577. In 1825 it was described by De Candolle as *Crataegus mexicana*, two years after Humboldt and Bonpland had published a description of it as *Mespilus pubescens*. It appears to have been introduced into England about 1824 by the eighth Lord Napier, through his friend A. B. Lambert. A tree at Kew, now about 15 ft. high, was received from the Jardin des Plantes, Paris, in 1891. It is quite hardy and is one of the finest Hawthorns in cultivation.

Salvia longistyla, a Mexican species, resembles *S. coccinea*, Linn., but its leaves and flowers are larger and the bilobed calyx has long acuminate lobes. In height it is extraordinary, the Kew plant being 14–15 ft. high after nine or ten months' growth. It flowers during the winter, and where sufficient space could be given to it a plant would make an ornamental feature in the conservatory. The figure was prepared from material obtained from the Kew plant, which was raised from a cutting presented by Dr. Robertson-Proschowsky of Nice.

The *Ceratostigma* is a new species which has been described and figured from material sent to Kew by Miss Willmott, who has two plants, now shrubs five feet high. It resembles the well-known *C. plumbaginoides*, Bunge, often known in gardens under Lindley's name of *Plumbago Larpentae*, but it is larger and looser in habit, and differs in several less striking characters. The home of *C. Willmottianum* is Western China, where it was collected by Mr. E. H. Wilson for the Arnold Arboretum.

North Gallery, Official Guide.—A revised and augmented edition of the Official Guide to the collection of paintings at Kew

by the late Miss Marianne North has just been issued. This forms the sixth edition since the original issue in 1882. A good deal of revision has been made in the descriptions of the plants from India, Ceylon and the East, and several additional determinations have been added. In nearly every case it has now been possible to identify exactly the plants depicted. The catalogue of the woods forming the panelled wainscot below the paintings has also undergone considerable revision and the majority of the timbers have now been identified.

The Cocoanut.*—The appearance of a new book dealing exclusively with the cocoanut palm indicates how great are the interests centred in the tree, for other modern books upon the same subject are in circulation. This latest work is by Mr. Edwin Bingham Copeland, Professor of Plant Physiology and Dean of the College of Agriculture, University of the Philippines, and has been written with a view to directing attention to the position occupied by the cocoanut in the Philippines and as an indication of the system of instruction upon the cocoanut and its uses imparted to students at the University. The preparation of the work was commenced in 1907, and it contains the results of Mr. Copeland's scientific and practical investigations between that date and the present.

After an introduction of some half-dozen pages, which deals in a general way with the cocoanut and its distribution, the author devotes a chapter to an interesting description of the physiology of the plant, in which he gives details of personal observations and of experiments conducted by his students. The next chapter deals with climate, soils and manures, and is followed by a chapter on diseases and pests. The chapter on the latter subject takes up 77 pages and deals exhaustively with fungus and insect enemies. Descriptions of the various diseases and pests are given, together with the results of investigations into their distribution and eradication.

Varieties of cocoanut, the selection of seed trees, and seed germination form the text of the next chapter, and it is followed by a lengthy chapter on field culture. In this the advantages and disadvantages of catch crops in young plantations are discussed. The concluding chapter deals with cocoanut products, full particulars of the preparation, with analysis when necessary, of toddy, sugar, arrack, vinegar, coir, copra and oil being given. Twenty-three illustrations add to the interest of the book and it is concluded by a good index.

The book throughout is full of interesting and instructive matter, which is presented in clear and easily understood language, and it can be confidently recommended, not only to intending planters, but to all who wish to learn about the cocoanut and its uses.

W. D.

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*The Coconut. By Edwin Bingham Copeland, Professor of Plant Physiology and Dean of the College of Agriculture, University of the Philippines. London: Macmillan & Co., Ltd.; pp. 206; 23 illustrations; price, 10s. net.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1914.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1913. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena adscendens.
glauca.
macrostemon.
microphylla.
myriophylla.
Novae-Zealandiae.

Acanthus longifolius.
Perringii.

Achillea Ageratum.
argentea.
Clavenae.
grandiflora.
Kellereri.
obscura.
Wilczeckii.

Aconitum Hemsleyanum.
Kusnezoffi.
rostratum.
Stoerckianum.
uncinatum.
volubile.
Vulparia.

Actaea spicata.
— var. rubra.

Adenostyles viridis.

Adlumia cirrhosa.

Aethionema cappadocicum.
cordatum.
grandiflorum.

(32417—6a.) Wt. 212—780. 1125. 11/13. D & S. A

Aethionema—*cont.*
iberideum.
pulchellum.
saxatile.

Agrimonia odorata.

Agropyron pungens.

Agrostis alba.
elegans.
nebulosa.

Allium angulosum.
caeruleum.
cyaneum.
Fetisowii.
giganteum.
grande.
kansuense.
karataviense.
neapolitanum.
odorum.
ostrowskianum.
paradoxum.
pulchellum.
siculum.
sphaerocephalum.
Tubergeni.
Wallichii.

Althaea armeniaca.
ficifolia.
kurdica.
pallida.
pontica.
rosea.
sulphurea.

Alyssum amanum.
incanum.
montanum.
podolicum.
saxatile var. citrinum.
serpyllifolium.
spinosum.

Amarantus caudatus.
hypochondriacus.
polygamus.
retroflexus.
speciosus.

Amethystea caerulea.

Ammobium alatum.

Anacyclus officinarum.

Anchusa capensis.
italica.

Anemone alpina.
decapetala.
multifida.
narcissiflora.
pratensis.
Pulsatilla.
rivularis.
sylvestris.

Anoda hastata.
Wrightii.

Anthemis cinerea.
mixta.

Anthericum Liliago.
ramosum.

Antirrhinum Asarina.
Orontium.
sempervirens.
tortuosum.

Apera Spica-Venti.

Aquilegia canadensis.
chrysantha.
caerulea.
flabellata.
glandulosa.
pyrenaica.

Arabis arenosa.
bellidifolia.
caerulea.
pumila.
Sturii.
verna.

Arenaria aretioides.
balearica.
capillaris.
cephalotes.
foliosa.
graminifolia.
grandiflora.
Ledebouriana.
montana.
pungens.
purpurascens.
sojanensis.

Argemone grandiflora.
hispida.
mexicana.
ochroleuca.

Armeria canescens.
chilensis.
latifolia.
majellensis.

Arnica amplexicaulis.
Chamissonis.
longifolia.
montana.
sachalinensis.

Artemisia paniculata.
parviflora.
scoparia.
Siversiana.
spicata.

Asperula azurea.
ciliata.
galioides.

Asphodeline lutea.

Asphodelus albus.

Aster alpinus.
batangensis.
diffusus.
diplostephioides.
Douglasii.
foliaceus.
glaucus.
Herveyi.
himalaicus.
macrophyllus.
radula.
Stracheyi.
subcaeruleus.

Astilbe chinensis.
Davidii.
grandis.
simplicifolia.
Thunbergii.
virescens.

Astragalus armeniacus.
chinensis.
danicus.
frigidus.

Astragalus—*cont.*
maximus.
pentaglottis.
xiphocarpus.

Astrantia Biebersteinii.
helleborifolia.

Athamanta Matthioli.

Atriplex littoralis.
nitens.
rosea.

Atropa Belladonna.
lutescens.

Aubrietia croatica.

Baeria coronaria.

Baptisia australis.

Beckmannia erucaeformis.

Berkheya Adlami.
purpurea.

Beta Bourgaei.
trigyna.

Bidens leucantha.

Biscutella laevigata.

Blumenbachia insignis.
muralis.

Bocconia cordata.
microcarpa.

Borago laxiflora.

Boykinia aconitifolia.

Brachycome iberidifolia.
— var. alba.

Brachypodium caespitosum.
japonicum.
pinnatum.
sylvaticum.

Brassica campestris.
Cheiranthos.
Erucastrum.
juncea.
rugosa.
Tourneforti.

Briza maxima.
minor.

Brodiaea Bridgesii.
Howellii.
ixioides.

Bromus adoënsis.
albidus.
breviaristatus.
carinatus.
ciliatus.
commutatus.
japonicus.
Kalmii.
macrostachys
marginatus.
maximus.
polyanthus.
rubens.
sitchensis.
squarrosus.
Tacna.
Trinii.
unioloides.

Bulbine longiscapa

Buphthalmum salicifolium.

Bupleurum Candollei.
stellatum.

Cakile maritima.

Calamagrostis confinis.
Epigeios.
varia.

Calamintha chinensis.
grandiflora.

Calceolaria integrifolia.
mexicana.
polyrrhiza.

Callirhoë pedata.

Callistephus hortensis.

Camassia esculenta.
Fraseri.
Leichtlinii.
montana.

Campanula alliariaefolia.
barbata.
bononiensis.
cervicaria.
elatinoides.
Grosseckii.
Kolenatiana.
lactiflora.
lanata.
latifolia.
latiloba.
longistyla.
Raddeana.
Scheuchzeri.
serotina.
sibirica.
thyrsoides.
versicolor.
Waldsteiniana.

Carduus defloratus.
niveus.
tenuiflorus.

Carex alopecoidea.
echinata.
hordeistichos.
pendula.
tomentosa.

Carthamus lanatus.
tinctorius.

Catananche caerulea.
lutea.

Celmisia holosericea.

Celsia orientalis.
pontica.

Centaurea axillaris.
babylonica.
dealbata.
macrocephala.
montana.
nigrescens.
ruthenica.
spicata.

Centranthus Sibthorpii.

Cephalaria alpina.
ambrosoides.
radiata.
transylvanica.

Cerastium Biebersteinii.
macranthum.
perfoliatum.
tomentosum.

Cerinthe major.
minor.

Chaerophyllum aromaticum.
nodosum.

Charieis heterophylla.

Chelidonium Franchetianum.
lasiocarpum.

Chelone Lyoni.
obliqua.

Chelonopsis moschata.

Chenopodium Bonus-Henricus.
capitatum.
urbicum.

Chorispora tenella.

Chrysanthemum Balsamita var.
tomentosum.
carinatum.
carneum.
caucasicum.
cinerariaefolium.
coronarium.
corymbosum.
maximum.
prealtum.

Chrysopogon Gryllus.

Cimicifuga cordifolia.
foetida.
simplex.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Cnicus monspessulanus.
oleraceus.
syriacus.

Cochlearia glastifolia.

Codonopsis ovata.

Collinsia bicolor.
grandiflora.

Collomia coccinea.
gilioides.
grandiflora.

Comanthospace sublanceolata.

Commelina coelestis.

Convolvulus Cupanianus.
farinosus.
tricolor.
undulatus.

Coreopsis lanceolata.

Coronilla cappadocica.
scorpioides.

Corydalis capnoides.
cheilanthifolia.
glauca.
lutea.
racemosa.

Corynephorus canescens.

Cosmos diversifolius.

Crambe orientalis.

Crepis aurea.
blattarioides.
incarnata.
pygmaea.
rubra.
sibirica.

Crocus asturicus.
aureus.
chrysanthus.
hadriaticus.
Imperati.
longiflorus.
medius.
pulchellus.
speciosus.
Tommasinianus.

Crucianella aegyptiaca.

Cynoglossum cheirifolium.
coelestinum.
Wallichii.

Cyperus esculentus.
longus.

Dactylis altaica.
Aschersoniana.

Dahlia coccinea.
variabilis.

Datisca cannabina.

Datura Tatula.

Delphinium Brunonianum.
caucasicum.
consolida.
decorum.
dyctiocarpum.
elatum.
Geyeri.
grandiflorum.
Maackianum.
occidentale.
Pylzowii.
speciosum.
— var. glabratum.

Demazeria loliacea.

Deschampsia caespitosa.
tenella.

Deyeuxia Langsdorfii.

Dianthus arenarius.
Armeria.
caesius.
callizonus.
capitatus.
carthusianorum.
Caryophyllus.
deltoides.
fragrans.
giganteus.
haematocalyx.
hirtus.
inodorus
liburnicus.
neglectus.
petraeus.
Requienii.
Seguieri.

Dianthus—*cont.*
squarrosus.
subacaulis.
superbus.
Waldsteinii.

Dictamnus albus.

Digitalis ambigua.
ferruginea.

Dimorphotheca aurantiaca.
hybrida.

Dipsacus asper.
atratus.
fullonum.
inermis.
pilosus.

Dorycnium herbaceum.

Downingia elegans.

Draba altaica.
Athoa.
Bertolonii.
bruniaefolia.
fladnizensis.
incana.
Loiseleurii.
pyrenaica.
rigida.
Salomonii.
tomentosa

Dracocephalum heterophyllum.
Moldavica.
peltatum.

Dryas octopetala.

Dulichium spathaceum.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinodorus ranunculoides.

Echinops dahuricus.
Ritro.

Echium italicum.
plantagineum.

Elsholtzia cristata.

Elymus arenarius.
canadensis.
virginicus.

Emilia flammea.

Epilobium Dodonaei.
nummularifolium.
rosmarinifolium.

Epipactis palustris.

Erigeron aurantiacus.
Coulteri.
glabellus.
glaucus.
grandiflorus.
macranthus.
Rusbyi.
salsuginosus.
trifidus.

Erinus alpinus.

Erodium cheilanthifolium.
corsicum.
daucoides.
gruinum.
hymenodes.
macradenum.
malacoides.
Manescavii.

Eruca sativa.

Eryngium agavifolium.
alpinum.
amethystinum.
Bourgati.
giganteum.
glaciale.
palmatum.
planum.
Serra.

Erysimum Perofskianum.
rupestre.

Erythraea Massonii.

Erythronium revolutum.

Eschscholzia caespitosa.
californica.
Douglasii.

Eucharidium concinnum.

Eupatorium ageratoides.
purpureum.

Euphorbia Heldreichii.
Kotschyana.

Ferula tingitana.

Festuca Eskia.
gigantea.
Myuros.
Poa.
rigida.
vaginata.

Fragaria indica.

Galega orientalis.
patula.

Galeopsis Ladanum.
Tetrahit.

Galium thymifolium.

Gastridium australe.

Gaudinia fragilis.

Gazania pygmaea.

Gentiana asclepiadea.
— var. alba.
crassicaulis.
Cruciata.
dahurica.
decumbens.
Fetisowii.
Freyniana.
Pneumonanthe.
septemfida.
straminea.
tibetica.
Walujewi.

Geranium albiflorum.
argenteum.
eriostemon.
ibericum.
incisum.
Lowei.
macrorhizum.
rivulare.
sessiliflorum.
yedoense.

Gerbera Anandria.
Bellidiastrum.
nivea.

Geum album.
bulgaricum.
chiloense.
Heldreichii.
montanum.
pyrenaicum.

Gilia achilleaefolia.
androsacea.
capitata.
densiflora.
liniflora.
micrantha.
multicaulis.
squarrosa.
tricolor.

Gillenia stipulacea.
trifoliata.

Glaucium corniculatum.

Glyceria distans.
plicata.

Grammanthes gentianoides.

Grindelia lanceolata.
robusta.
squarrosa.

Gypsophila acutifolia.
paniculata.
prostrata.
Steveni.
viscosa.

Hablitzia tamnoides.

Hastingsia alba.

Hebenstretia tenuifolia.

Hedysarum altaicum.
esculentum.
flavescens.
Semenovii.

Helenium Bolanderi.
Hoopesii.
mexicanum.

Helianthemum Tuberaria.

Helianthus cucumerifolius.
Nuttallii.
occidentalis.

Helichrysum bracteatum.

Heracleum Mantegazzianum.
persicum.

Hesperis matronalis.

Heuchera Drummondii.
foliosa.
glabra.
pilosissima.

Hibiscus Trionum.

Hieracium alpinum.
amplexicaule.
Bornmülleri.
Grisebachii.
gymnocephalum.
Heldreichii.
villosum.

Hilaria rigida.

Hordeum bulbosum.
jubatum.

Horminum pyrenaicum.

Hunnemannia fumariaefolia.

Hyoscyamus albus.

Hypecoum grandiflorum.
procumbens.

Hypericum Ascyrum.
Coris.
delphicum.
hirsutum.
Kotschyanum.
linarifolium.
olympicum.

Hypochaeris glabra.

Iberis Amara.
Jordani.
Lagascana.

Impatiens amphorata
scabrida.

Inula bifrons.
ensifolia.
hirta.
macrocephala.
orientalis.
racemosa.
Royleana.
squarrosa.

Iris bucharica.
caroliniana.
juncea.
laevigata.
missouriensis.
tingitana.

Isatis glauca.
Villarsii.

Juncus alpinus.
Chamissonis.

Jurinia cyanoides.

Kitaibelia vitifolia.

Koeleria albescens.
phleoides.
splendens.

Lactuca Bourgaei.
perennis.

Lallemantia canescens.

Lamarckia aurea.

Lathyrus angulatus.
Aphaca.
articulatus.
cirrhosus.
Clymenum.
luteus.
maritimus.
Nissolia.
Ochrus.
polyanthus.
rotundifolius.
setifolius.
tingitanus.
tuberosus.
undulatus.
variegatus.
venosus.

Lavatera cachemiriana.
trimestris.
— var. alba.

Layia glandulosa.
platyglossa.

Leonurus Cardiaca.
sibiricus.
tataricus.

Leptosyne Douglasii.
maritima.
Stillmanni.

Leuzea conifera.

Liatris spicata.

Libertia ixioides.

Ligusticum alatum.
discolor.
pyrenaicum.
scoticum.

Limnanthes alba.
Douglasii.

Linaria alpina.
anticaria.
aparinoides.
bipartita.
macedonica.
maroccana.
multipunctata.
repens.
saxatilis.
Tournefortii.
tristis.

Linum angustifolium.
capitatum.
grandiflorum.
narbonense.
nervosum.
usitatissimum.

Lobelia inflata.
sessilifolia.

Lonas inodora.

Lopezia coronata.

Lotus Requienii.
Tetragonolobus.

Lunaria annua.

Lupinus concinnus.
densiflorus.
elegans.
Hartwegii.
micranthus.
mutabilis.
nanus.
pubescens.
texanus.

Luzula albida.
nivea.

Lychnis alpina.
chalcedonica.
Coeli-rosea.
Lagascae.
Preslii.
Sartori.

Lysichitum camtschatcense.

Lysimachia atropurpurea.
clethroides.
davurica.
punctata.

Madia dissitiflora.
elegans.
sativa.

Malcomia africana.
chia.

Malva Duriaei.
parviflora.

Malvastrum limense.

Matricaria Tchihatchewii.

Matthiola sinuata var. glabra albiflora.

Meconopsis aculeata.
cambrica.
heterophylla.
racemosa.
sinuata var. latifolia.
Wallichii.

Medicago Echinus.
Helix.
hispida.
orbicularis.
ovalis.
scutellata.
turbinata.

Melica altissima.
ciliata.
nutans.

Meum Athamanticum.

Mimulus alsinoides.
Lewisii.

Mirabilis divaricata.
Jalapa.
longiflora.

Molinia caerulea.

Molopospermum cicutarium.

Moricandia arvensis.

Moscharia pinnatifida.

Muehlenbergia mexicana.

Muscari armeniacum.
compactum.
neglectum.
paradoxum.
parviflorum.

Myosurus minimus.

Myriactis Gmelini.

Myriocephalus Stuartii.

Nepeta caesarea.
concolor.
discolor.
macrantha.
nuda.

Nicotiana affinis.
Langsdorffiii.
paniculata.
rustica.
Sanderae.
Tabacum.

Nigella corniculata.
damascena.
hispanica.
integrifolia.

Oenothera acaulis.
amoena.
densiflora.
pumila.

Oenothera—*cont.*
Romanzowii.
rosea.
tenella.
tenuifolia.

Omphalodes linifolia.

Ononis alopecuroides.
hircina.
natrix.

Onopordon Acanthium.
bracteatum.

Onosma albo-roseum.

Ornithogalum arcuatum.
narbonense.

Oryzopsis miliacea.

Ostrowskia magnifica.

Oxyria digyna.

Oxytropis campestris.
sulphurea.

Paeonia decora var. alba.
microcarpa.
mollis.
paradoxa.

Panicum capillare.

Papaver alpinum.
Argemone.
commutatum.
glaucum.
nudicaule.
orientale.
pavoninum.
pilosum.
rupifragum.
somniferum.

Parnassia palustris.

Pennisetum macrourum.

Pentstemon acuminatus.
campanulatus.
confertus.
deustus.
diffusus.
gentianoides.
glaucus.

Pentstemon—*cont.*
heterophyllus.
humilis.
isophyllus.
laevigatus.
linarioides.
ovatus.
pubescens.
pygmaeus.
secundiflorus.
virgatus.

Peucedanum hispanicum.

Phacelia campanularia.
malvaefolia.
Parryi.
tanacetifolia.
viscida.
Whitlavia.

Phalaris minor.
nodosa.
paradoxa.
tuberosa.

Phleum arenarium.
asperum.
Michelii.

Phlomis cashmiriana.
pratensis.
setigera.
tuberosa.
umbrosa.
viscosa.

Physalis Alkekengi.
Bunyardi.
Francheti.
philadelphica.

Physochlaina orientalis

Physostegia virginiana.
— var. speciosa.

Phyteuma canescens.
Michelii.
orbiculare.
Scheuchzeri.
serratum.
spicatum.

Phytolacca acinosa.
decandra.

Plantago Coronopus.
Cynops.
maritima.
maxima.
ovata.
Psyllium.
tibetica.

Platycodon glaucum.
grandiflorum.
— var. Mariesii.

Platystemon californicus.

Pleurospermum Golaka.

Poa caesia.
cenisia.
Chaixii.
violacea.

Podolepis
affinis.

Podophyllum peltatum.

Polemonium flavum.
foliosissimum.
grandiflorum.
humile.

Polygonum alpinum.
compactum.
rude.
tortuosum.
viviparum.
Weyrichii.

Polypogon littoralis.
monspeliensis.

Potentilla arguta.
argyrophylla.
crinita.
dealbata.
Detommasii.
Fenzlii.
glandulosa.
gracilis.
Herbichii.
Hippiana.
Leschenaultiana.
mollis.
montenegrina.
multifida.
nepalensis.

Potentilla—*cont.*
nevadensis.
pennsylvanica.
recta.
— var. macrantha.
rivalis.
rupestris.
semilaciniata.
sericea.
tanacetifolia.
Thurberi.

Poterium alpinum.

Pratia angulata.
arenaria.

Primula angustidens.
Beesiana.
capitata.
Cockburniana.
denticulata.
frondosa.
Giraldiana.
mollis.
pseudo-sikkimensis.
pulverulenta.
rosea.
saxatilis.

Psoralea acaulis.
macrostachya.
physodes.

Pycnanthemum lanceolatum.

Ramondia pyrenaica.
serbica.

Ranunculus Nyssanus.
Chius.
parnassifolius.

Rehmannia chinensis.

Relhania sessiliflora.

Reseda alba.
virgata.

Rhagadiolus edulis.

Rheum Fedtschenkiana.
undulatum.
Webbianum.

Rodgersia aesculifolia.
pinnata.
podophylla.

Roemeria hybrida.

Romulea candida.

Rudbeckia amplexicaulis.
californica.
subtomentosa.

Rumex bucephalophorus.
maximus.
orientalis.
salicifolius.
sanguineus.

Salvia argentea.
Beckeri.
Bertolonii.
carduacea.
Columbariae.
Horminum.
japonica.
orgyalis.
Schiedeana.
taraxifolia.
tiliaefolia.
verbascifolia.
verticillata.
virgata.
viridis.
viscosa.

Sambucus Ebulus.
— var. latifolius.

Saponaria caespitosa.
Vaccaria.

Saussurea albescens.
hypoleuca.
salicifolia.

Saxifraga bronchialis.
caespitosa.
canaliculata.
cochlearis.
— var. minor.
decipiens.
globulifera.
lingulata var. lantoscana.
luteo-viridis.
pedemontana.
pennsylvanica.
rotundifolia.

Saxifraga—*cont.*
Sibthorpii.
sponhemica.
tellimoides.
virginiensis.

Scabiosa balcanica.
caucasica.
caucasica var. connata.
dipsacifolia.
graminifolia.
longifolia.
prolifera.
vestina.

Schizanthus Grahami.
pinnatus.
retusus.

Scilla autumnalis.
cilicica.
peruviana.

Scopolia lurida.
sinensis.

Scrophularia orientalis.
alata.
Scorodonia.

Scutellaria altissima.
alpina.
indica var. japonica.
orientalis.
pinnatifida.
Tournefortii.

Securigera Coronilla.

Sedum Anacampseros.
Ewersii.
maximum.
spathulifolium.
stoloniferum.
ternatum.

Selinum serbicum.
tenuifolium.

Senecio abrotanifolium.
adonidifolium.
Clivorum.
— var. subcrenata.
Doria.
Doronicum.
elegans.
Ledebouri.

Senecio—*cont.*
Ligularia.
nemorensis.
squalidus.
stenocephalus.
suaveolens.
umbrosus.
Veitchianus.
Wilsoniana.

Serratula Gmelinii.
heterophylla.
quinquefolia.
tinctoria.
— var. monticola.

Seseli elatum.
Libanotis.

Sesleria argentea.

Setaria glauca.
italica.

Sidalcea candida.
malvaeflora.
neo-mexicana.
spicata.

Siderites scordioides.

Siegesbeckia orientalis.

Silene acaulis.
alpestris.
Armeria.
asterias.
ciliata.
elegans.
fimbriata.
fruticulosa.
gigantea.
laeta.
melandrioides.
Muscipula.
noctiflora.
nocturna.
paradoxa.
pendula.
quadrifida.
Saxifraga.
Schafta.
squamigera.
tatarica.
tenuis.
verecunda.
wolgensis.
Zawadskii.

Silphium integrifolium.
trifoliatum.
— var. ternatum.

Silybum Marianum.

Sisymbrium strictissimum.

Sisyrinchium chilense.
filifolium.
striatum.

Specularia hybrida.
pentagonia.
perfoliata.
Speculum.

Stachys Alopecuros.
arenaria.
coccinea.
discolor.
graeca.
grandiflora.
longifolia.

Statice auriculaefolia.
cosyrensis.
Gmelinii.
occidentalis.
Suwarowii.

Stipa Calamagrostis.
capillata.
papposa.
splendens.
viridula.

Symphyandra armena.
pendula.
Wanneri.

Symphytum asperrimum.

Synthyris reniformis.

Telephium Imperati.

Teucrium Arduinii.
flavum.
multiflorum.
pyrenaicum.

Thalictrum angustifolium.
aquilegifolium.
corynellum.
Fendleri.
maximum.
squarrosum.

Thermopsis fabacea.
lanceolata.
montana.

Tragopogon orientale.

Tricholepis furcata.

Trifolium alpestre.
hybridum.
incarnatum.
Johnstoni.
Lupinaster.
medium.
ochroleucum.
pannonicum.
physodes.
pratense.
rubens.

Trigonella caerulea.
corniculata.
cretica.
Foenum-graecum.
polycerata.

Tulipa Batalini.
dasystemon.
Kaufmanniana.
linifolia.
stellata.

Tunica Saxifraga.

Ursinia pulchra.

Urtica pilulifera.

Valerianella Auricula.
coronata.
dentata.
Dioscoridis.
echinata.
eriocarpa.

Verbascum Blattaria.
leianthum.
Lychnites.
olympicum.
phoeniceum.

Verbena Aubletia.
bonariensis.
prostrata.

Verbesina helianthoides.
Purpusii.

Veronica austriaca.
crassifolia.
gentianoides.
glauca.
Guthriana.
incana.
incisa.
longifolia.
monticola.
saxatilis.
spicata.
— var. hybrida.
virginica.

Vesicaria grandiflora.
sinuata.
utriculata.

Vicia angustifolia.
atropurpurea.
calcarata.
canescens.
melanops.
Orobus.
pannonica.
pisiformis.
sicula.
sylvatica.
unijuga.
villosa.

Vincetoxicum fuscatum.

Viola cornuta.
gracilis.
lutea.
Nuttallii.
persicifolia.

Volutarella Lippii.

Wahlenbergia albomarginata.
saxicola.
vincaeflora.

Zygadenus elegans.

TREES AND SHRUBS.

Acanthopanax divaricatum.
sessiliflorum.

Acer circinatum.
Heldreichii.
macrophyllum.
Miyabei.
nikoense.
tetramerum.
Trautvetteri.

Ailanthus glandulosa.

Alnus barbata.
cordifolia.
elliptica.
incana.
japonica.
nitida.
oregona.
orientalis.
sitchensis.
Spaethii.
tenuifolia.
viridis.

Amelanchier florida.

Baccharis patagonica.

Berberis angulosa.
aristata.
brevipaniculata.
concinna.
Darwinii.
diaphana.
dictyophylla.
Hookeri.
Leichtlinii.
parviflora.
polyantha.
pruinosa.
Stapfiana.
Thunbergii.
umbellata.
Vilmoriniana.
virescens.
Wilsonae.
yunnanense.

Betula alaskana.
caerulea.
Ermani.
— var. nipponica.
fruticosa.
glandulosa.
humilis.
lenta.
lutea.
papyrifera.
populifolia.
pumila.

Bruckenthalia spiculifolia.

Bryanthus Breweri.

Buddleia albiflora.
japonica.
nivea.
variabilis.
— var. Veitchiana.

Calophaca wolgarica.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
frutescens.

Carmichaelia flagelliformis.

Carya porcina.

Ceanothus americanus.
dentatus.
Fendleri.
integerrimus.
thyrsiflorus.
velutinus.

Celastrus articulatus.
flagellaris.

Celtis occidentalis.

Cephalanthus occidentalis

Cephalotaxus drupacea
pedunculata.

Cercis Siliquastrum.

Cistus albidus.
creticus.
crispus.
florentinus.
hirsutus.
laurifolius.
monspeliensis.
platysepalus.
salvifolius.

Cladrastis amurensis.

Clematis aethusifolia var. latisecta.
campaniflora.
coccinea.
Delavayi.
Flammula.
fusca.
heracleaefolia.
integrifolia.
mandshurica.
montana.
nutans.
Pseudo-flammula.
songarica.

Colutea arborescens.
bullata.
cilicica.
cruenta.
istria.
media.

Cornus alba.
candidissima
glabrata.
stricta.

Cotoneaster acutifolia.
affinis.
amoena.
applanata.
bacillaris.
bullata.
buxifolia.
divaricata.
Fontanesii.
Franchetii.
frigida.
horizontalis.

Cotoneaster—*cont.*
humifusa.
integerrima.
Lindleyi.
microphylla, var. glacialis.
multiflora.
Nummularia.
pannosa.
rotundifolia.
Simonsii.
thymifolia.
uniflora.

Crataegus altaica.
atrorubens.
Azarolus.
Carrierei.
coccinea.
cordata.
Crus-Galli.
Dippeliana.
durobrivensis.
elliptica.
flava.
foetida.
Laurentiana.
macrantha.
melanocarpa.
mexicana.
modesta.
mollis.
nigra.
orientalis.
Peckii.
pentandra.
praecox.
tanacetifolia.
tomentosa.
Vailiae.

Cryptomeria japonica.

Cupressus Goveniana.
Lawsoniana.
nootkatensis.
obtusa.
thyoides.
torulosa.

Cydonia Maulei.

Cytisus albus.
biflorus.
capitatus.
hirsutissimus.
leucanthus.
microphyllus.

Cytisus—*cont.*
nigricans.
praecox.
purgans.
scoparius var. Andreanus.
sessilifolius.

Daboëcia polifolia.

Decaisnea Fargesii.

Desmodium canadense.
tiliaefolia.

Deutzia crenata.
longifolia.
scabra.
Sieboldiana.

Diervilla florida.
sessilifolia.

Elaeagnus multiflora.
umbellata.

Eleutherococcus Henryi.
Simonii.

Erica scoparia.
stricta.

Escallonia pterocladon.

Euonymus americanus.
latifolius.
oxyphyllus.
planipes.
yedoensis.

Exochorda Alberti.

Garrya elliptica.

Gaultheria Shallon.

Genista aethnensis.
cinerea.
germanica.
pilosa.
radiata.
sagittalis.
tinctoria.
— var. elatior.
— var. mantica.
virgata.

Halesia hispida.
tetraptera.

Halimodendron argenteum.

Hedysarum multijugum.

Helianthemum alyssoides.
halimifolium.
polifolium.
vineale.

Hippophaë rhamnoides.

Hydrangea aspera.
Bretschneideri.
petiolaris.
vestita.

Hypericum Androsaemum.
Ascyron.
aureum.
Buckleii.
elatum.
Hookerianum.
patulum.
— var. Henryi.

Ilex integra.
opaca.
Sieboldii.
verticillata.

Indigofera Gerardiana.

Jamesia americana.

Jasminum fruticans.
humile.

Juglans nigra.

Kalmia cuneata.
glauca.

Laburnum alpinum.

Leiophyllum buxifolium.

Leucothoe Catesbaei.

Leycesteria formosa.

Lonicera deflexicalyx.
dioica.
Henryi.

Lonicera—*cont.*
iberica.
involucrata.
Maackii.
Morrowi.
myrtillus.
orientalis.
prostrata.
segreziensis.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium chinense var. carnosum.
Grevilleanum.
pallidum.

Lyonia ligustrina.

Menispermum canadense.

Menziesia globularis.

Myricaria germanica.

Neillia amurensis.
capitata.
opulifolia.
Ramuleyi.
stellata.
Torreyi.

Nesaea salicifolia.

Olearia Haastii.

Ononis arragonensis.
fruticosa.

Paliurus australis.

Pernettya mucronata.

Petteria ramentacea.

Philadelphus californicus.
Gordonianus.
grandiflorus.
latifolius.
Lewisii.
tomentosus.

Pinus monticola.
Strobus.

Platanus orientalis.

Potentilla fruticosa.
— var. Veitchii.
Salesoviana.

Prunus acida var. semperflorens.
cornuta.
Cuthbertii.

Ptelea trifoliata.

Pyrus alnifolia.
alpina.
americana.
arbutifolia.
crataegifolia.
elaeagrifolia.
Michauxi.
minima.
Niedzwetzkyana.
nigra.
prunifolia.
Ringo.
rotundifolia.
sambucifolia.
Sargentii.
Schiedeckeri.
sikkimensis.
Toringo.
Tschonoski.
Zumi.

Rhamnus cathartica.
davurica.
Erythroxylon.
fallax.
Frangula.
Purshiana
spathulaefolia.

Rhododendron halense.
maximum.
racemosum.

Rhodotypos kerrioides.

Ribes alpinum.
amictum.
bracteosum.
cruentum.
divaricatum.
mogollonicum.
petraeum.
rotundifolium.

Robinia Kelseyi.

Rosa Fendleri.
Hugonis.
nitida.
pisocarpa.
rubrifolia.
sericea.
sertata.
Webbiana.

Rubus adenophorus.
biflorus var. quinqueflorus.
calycinus.
diversifolius.
flosculosus.
Giraldianus.
Kuntzeanus.
lasiostylus.
nigro-baccus.
parvifolius.
phoenicolasius.
pubescens.
xanthocarpus.

Ruta graveolens.

Securinega fluggeoides.

Skimmia japonica.
Laureola.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
arborea var. glabrata.
assurgens.
brachybotrys.
bracteata.
canescens.
chamaedrifolia.
Lindleyi.
Nobleana.
salicifolia.
stellipila.

Spiraea—*cont.*
trilobata.
Veitchii.
Wilsonii.

Staphylea colchica.
Coulombieri.
pinnata.
trifolia.

Stephanandra Tanakae.

Stranvaesia undulata.

Styrax japonicum.

Symphoricarpus Heyeri.
racemosus.

Syringa Emodi.
pekinensis.

Taxus cuspidata.

Thuya orientalis.

Vaccinium corymbosum.
hirsutum.
padifolium.
pallidum.

Veronica carnosula.

Viburnum cotinifolium.
dilatatum.
Lantana.
Lentago.
Opulus.
orientale.
phlebotrichum.
pubescens.
rhytidophyllum.
Sargentii.
venosum.

Zanthoxylum Bungei.

Zenobia speciosa.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1914.

NOTE.

In the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1913, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

(3238.) Wt. 225—595. 1,125. 5/14. J. T. & S. G. 14.

CATALOGUE OF THE LIBRARY.

Additions received or incorporated during 1913.

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Nyasaland. Cultural Products, Agriculture, &c. Correspondence and miscellaneous printed matter, 1899–1913. fol.

Oil Palm. Correspondence and miscellaneous printed matter, 1876–1913. fol.

Peru. See **Ecuador, Peru, & Bolivia.**

Rhodesia. Miscellaneous papers, 1889–1913. Chiefly correspondence. fol.

St. Helena. Miscellaneous papers, 1836–1913. Chiefly correspondence. fol.

Seychelles. Botanic Station, Cultural Products, &c., 1875–1913. Chiefly correspondence. fol.

Sierra Leone. Cultural Products. Chiefly correspondence, 1877–1913. fol.

Sierra Leone. Forestry, Agriculture, Botany, &c. Correspondence and miscellaneous printed matter, 1862–1912. fol.

Sikkim. Cinchona, 1863–1913. 2 vols. fol. (Annual Reports on the Government Cinchona Plantation and Factory in Bengal, miscellaneous printed matter and correspondence.)

Sikkim. Cinchona Febrifuge, 1880–84. Chiefly correspondence. fol.

Somaliland. See **Abyssinia & Somaliland.** 1886–1913.

Tatham, John. Catalogue of his Herbarium of British Plants. 1 vol. 8vo.—List of the genera in the Herbarium of J. T., prepared by Rachel F. Thompson. 1 f.—Catalogue [printed, with MS. additions] of British Plants included in Hooker's British Flora, ed. 2, vol. i., showing the species in the Herbarium of J. T. 8vo. mounted on linen.

S. P. Thompson.

Uganda. Cultural Products, &c. Chiefly correspondence, 1906–13. fol.

Zeyen, Elfriede. See **Kerner von Marilaun, A.**

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1914.

NEW GARDEN PLANTS OF THE YEAR 1913.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1913. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1913, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows:—*Bees, Cat.*—Bees, Ltd. Catalogue of Hardy Plants. *B. K.*—Vaupel, Blühende

(3344.) Wt. 225—595. 1,125. 8/14. J. T. & S. G. 14.

Kakteen. *B. M.*—Botanical Magazine. *B. M. H. N.*—Bulletin du Muséum d'Histoire Naturelle, Paris. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Dykes, Iris*—W. R. Dykes. The Genus Iris. *Fedde, Repert.*—Fedde, Repertorium specierum novarum regni vegetabilis. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *J. R. H. S.*—Journal of the Royal Horticultural Society. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *Lemoine, Cat.*—Lemoine, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. G. Z.*—Möllers Deutsche Gärtner-Zeitung. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Dahlem bei Steglitz (Berlin). *N. B. G. Edinb.*—Notes from the Royal Botanic Garden, Edinburgh. *O. G. Z.*—Oesterreichische Garten Zeitung. *O. R.*—Orchid Review. *Orchis.*—Orchis. Beilage zur Gartenflora. *O. W.*—The Orchid World. *Pl. Wils.*—Plantae Wilsonianae, edited by C. S. Sargent. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sargent, T. & S.*—Sargent, Trees and Shrubs. *Späth, Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch, N. H. P.*—J. Veitch & Sons, New Hardy Plants from Western China.

The abbreviations in the descriptions of the plants are:—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H.H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies concolor Schrammii. (*M. D. G.* 1913, 322, f.) Coniferae. H. A form of *A. concolor violacea* in which the leaves are almost quite straight, instead of sickle-shaped, and the 2 series are so arranged as to form an acute angle with one another. (Barnstorffe Parkanlage, Rostock, Germany.)

Abies recurvata. (*M. D. G.* 1913, 265; *Pl. Wils.* ii. 44.) H. A handsome species growing up to 130 ft. high, with a pyramidal habit. Leaves strongly recurved, shining green on both sides or very glaucous on the upper. Cones in clusters on the topmost branches, oblong-ovoid, 2–4 in. long, intense violet-purple when growing, grey-brown when ripe and dry. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Acer Oliverianum.** (*Veitch, N. H. P.* 1913, 7.) Sapindaceae. H. Similar to *A. palmatum* in habit, but it has 5-lobed pale green leaves. It grows to a height of 15 ft. Central China. (J. Veitch & Sons.)

***Acer pictum mono.** (*Veitch, N. H. P.* 1913, 7.) H. A distinct form. Leaves 3–5-lobed, with attenuated apices, shining green above, covered beneath with a soft velvety pubescence. Central China. (J. Veitch & Sons.) [=*A. pictum* var. *parviflorum* f. *tricuspis*, Rehder; M. D. G. 1913, 258.]

Acer platanoides pendulum. (*M. D. G.* 1913, 322.) H. A form with pendulous branches. (W. F. Niemetz, Temesvár, Hungary.)

Aconitum Ackermannii. (*G. C.* 1913, liii. 53; liv. 180.) Ranunculaceae. H. A garden form of *A. Napellus*. The plant grows about 2½ ft. high and flowers in August. Flowers blue and white. (S. Arnott.)

***Adenophora megalantha.** (*N. B. G. Edinb.* v. 175; *Bees, Cat.* No. 41, 1913, 6, f.) Campanulaceae. H. A perennial herb growing about 18 in. high, remarkable in having the leaves puberulous above and in the very large pale porcelain-blue flowers. Leaves obovate or obovate-elliptic, 3–4 in. long, coarsely toothed. Corolla nearly 2 in. long. Western China. (Bees, Ltd.)

Adiantum Rollandiae. (*R. H.* 1913, 391.) Filices. G. Garden hybrid

between *A. microphyllum* and *A. Sanctae-Catharinae* (*A. trapeziforme* var. *Catharinae*). (C. Le Couteulx, Chesnay, Versailles.)

***Aesculus georgiana.** (*Sargent, T. & S.* ii. 259, t. 197.) Sapindaceae. H. A broad round-topped shrub, 3–6½ ft. high, distinguished by its short compact inflorescence and red petals, and in the normal form by its glabrous leaflets. Flowers 1¼–1½ in. long. Georgia, U.S.A. (Arnold Arboretum.)

Aesculus georgiana var. **pubescens.** (*Sargent, T. & S.* ii. 259.) H. Differs from the typical form in having the leaflets covered below early in the season with a loose pale pubescence. Georgia, U.S.A. (Arnold Arboretum.)

***Aesculus glabra** var. **Buckleyi.** (*Sargent, T. & S.* ii. 262.) H. Differs from the type in having usually 7 narrower and more acuminate leaflets, which are coated below, like the young branchlets, with close fine pale pubescence. Missouri, Iowa & Arkansas, U.S.A. (Arnold Arboretum.)

Aesculus glabra var. **leucodermis.** (*Sargent, T. & S.* ii. 262.) H. Characterised by the smooth pale often nearly white bark of the trunk and branches. South-eastern United States. (Arnold Arboretum.)

Aesculus Harbisoni. (*Sargent, T. & S.* ii. 259.) H. Supposed to be a natural hybrid between *A. georgiana* and *A. discolor* var. *mollis?* Georgia, U.S.A. (Arnold Arboretum.)

Aesculus woerlitzensis var. **Ellwangeri.** (*M. D. G.* 1913, 258.) H. Characterised by the leaves being sparingly or very sparingly villous beneath and furnished with 24–27 nerves on each side, and the deeper colour of the flowers. (Arnold Arboretum.)

Agapanthus hybridus. (*J. R. H. S.* xxxix. 363.) Liliaceae. G. Garden hybrid between *A. umbellatus* and *A. Mooreanus* [=*A. umbellatus* var. *Mooreanus*.] (Scheubel.)

Agapanthus Milleri. (*G. C.* 1913, liv. 217.) G. Garden hybrid between *A. umbellatus* and *A. caulescens.* (W. Müller, Fratte di Salerno, Italy.)

Agapanthus umbellatus monstrosus. (*J. R. H. S.* xxxix. 364.) G. A very robust form, with leaves 2½–3 in. broad. Umbels containing several hundred flowers. Perianth of many segments. (A. Worsley.)

Agapanthus umbellatus repens. (*J. R. H. S.* xxxix. 364.) G. "A small-growing form with creeping rootstock, narrow and short leaves, and flowers like *A. Mooreanus.*" (A. Worsley.)

***Agapanthus Weilligii.** (*G. C.* 1913, liv. 125; *G. M.* 1913, 633, f.) G. Leaves deciduous, six to a bulb, short, rigid, erect, deeply channelled, subglaucous. Umbel about 60-flowered, denser than in *A. umbellatus*. Flowers erect in bud, drooping vertically when open, subcampanulate, not more than ¾ in. across at the throat of the tube, which is 1½ in. long, deep violet at the base, othewise pale blue-violet except for a dark line running up the inside; lobes about ¾ in. long. (A. Worsley. [*A. Weillighi;* J. R. H. S. xxxix. 363. =*A. inapertus*, Beuaverd.]

Agave Vilmoriniana (*Fedde, Repert.* xii. 503.) Amaryllidaceae. G. A new species apparently allied to *A. Ellemeetiana*, but its flowers are at present unknown. Leaves about 25, in a loose rosette, narrowly linear-lanceolate, long and gradually acuminate, entire, flat on the upper side in the lower part, channelled above, convex beneath, furnished with a slender terminal spine 1½–1¾ in. long. Mexico. (Paris B. G.)

***Alnus cremastogyne.** (*K. B.* 1913, 164, t.) Betulaceae. H. An elegant tree, reaching a height of 80–100 ft. Leaves obovate or oval, 2½–5½ in. long, 1½–3 in. broad, acute or cuspidate, broadly cuneate or rounded at the base, unevenly serrate, dark glossy green and glabrous above, with tufts of brown hairs in the axils of the veins beneath; petiole ¼–½ in. long. Female strobiles solitary, ovoid, ¾ in. long, ½ in. broad, borne on slender peduncles 1½–2½ in. long. Western China. (Arnold Arboretum; Kew.)

***Alnus lanata.** (*K. B.* 1913, 164.) H. Closely allied to *A. cremastogyne* and possibly only a variety of that species, differing by the dense covering of brown wool on the branchlets, petioles, peduncles, and the underside of the leaves. Western China. (Arnold Arboretum.)

Amorphophallus corrugatus. (*B. M.* t. 8475.) Araceae. S. A new species most nearly allied to *A. Kerrii*, but it has dark purple ovaries, longer

styles, and a very much corrugated appendix to the spadix. Siam. (Trinity Coll. B. G., Dublin.)

Amygdalus warleyensis. (*G. C.* 1913, liii. 61.) Rosaceae. H. An open bush about 6 ft. high, with slender dark brown twigs. Flowers not showy, about ⅜ in. across, produced freely in twos and threes on leafless wood of the previous year. Calyx reddish, finely toothed. Petals pinkish-white, ⅛ in. long, 1-12 in. broad. Country not known. (Miss Willmott.)

***Androsace tibetica.** (*G. C.* 1913, liii. 256, 362, f. 154. Primulaceae. H. A small-growing species, in habit somewhat resembling *A. sempervivoides*, but it has broader leaves, and the whole plant is more softly hairy. Leaves in rosettes, spathulate, about ¾ in. long and ½ in. broad; new rosettes are produced on short stolons which arise at the time of flowering. Flowering-stem about 1 in. long. Umbels 6–9- flowered. Pedicels long. Flowers about ⅜ in. across, white, with a yellow eye. In text (p. 362) this plant is referred to as *A. tibetica* var. *Mariae*, which has broader leaves than the type. Kansu, China. (J. Veitch & Sons.)

***Anemone Pulsatilla rosea.** (*G. C.* 1913, liii. 57, suppl. ill.) Ranunculaceae. H. A sport from the type from which a form with pink flowers has been selected. (Royal Tottenham Nurseries, Holland.)

Angraecum recurvum. (*G. C.* 1913, liv. 367, f. 132; *G. M.* 1913, 899, f.; *O. R.* 1913, 369, f. 65.) Orchidaceae. S. A strong-growing species producing its numerous flowers from the old stems. Pedicels slender, 6 in. long, 1 flowered. Flowers pure white, fragrant, stellate, about 2 in. across. Lip rather broader than the equal sepals and petals. Spurs long, slender. Madagascar. (Charlesworth & Co.)

Anthurium conchiflorum. (*G. C.* 1913, liii. 334.) Araceae. S. Garden hybrid between *A. Chamberlainianum* and *A. Scherzerianum*. (Sir Trevor Lawrence.)

Ariocarpus trigonus. (*M. K.* 1913, 65, ff.) Cactaceae. G. Plant simple or with several heads, about 4 in. high and 5 in. across. Tubercles up to 2 in. long, more or less sharply 3-angled, with a shining horny obtuse apex. Flowers from the axils near the summit, funnelshaped-campanulate, at first white, later more or less rose-coloured, nearly 2 in. long including the ovary, about 1¾ in. across. Mexico. (R. Graessner, Perleberg, Germany; Darmstadt B. G.) [Syn. *Anhalonium trigonus*, Weber.]

Arthrostylidium angustiflorum. (*K. B.* 1913, 268.) Gramineae-Bambuseae. S. Stems slender, with very many whorled erect-spreading very slender branches 6–8 in. long. Leaves linear, long-attenuated above, contracted at the base into a short pubescent petiole, 2–3½ in. long, 2¼–2½ lin. broad. Spikelets in terminal 1-sided racemes ½–¾ in. long. Tropical America. (F. Sander & Sons.)

Asparagus robustus floribundus. (*M. G. Z.* 1913, 14, 68.) Liliaceae. G. Apparently the same as *A. Lutzii* (*A. erectus floribundus*) of the list for 1912. (T. Lattmann, Blankenburg am Harz, Germany.)

***Aster Purdomii.** (*B. M.* t. 8476; *G. C.* 1913, liii. 333; *Gard.* 1913, 260, 271, f.) Compositae. H. A pretty and distinct new species differing from all the other Asiatic Asters by the stalked ovate or ovate-elliptic radical leaves, with 2 or 3 small teeth, scarcely leafy flowering-stems, solitary flower-heads, and by the outer bristles of the pappus being much shorter than the inner. The flower-heads are pale violet, 2½ in. across. Northern China. (J. Veitch & Sons.)

***Aster yunnanensis atroviridis.** (*G. M.* 1913, 217; *Bees, Cat.* No. 41, 1913, 6.) H. A dwarf-growing plant, only about 9 in. high. Flower-heads with broad light-blue ray-florets. Yunnan, China. (Bees, Ltd.)

***Berberis aggregata.** (*G C.* 1913, liv. 225; *G. M.* 1913, 744.) Berberidaceae. H. A small spreading bush. Leaves in rosettes about 9 together, ovate to oblanceolate, entire or with a few teeth or spiny hairs in the upper half, dull green above, grey-green beneath, usually about ½ in. long and ¼ in. broad. Berries small, creamy green, suffused with coral, in dense sessile clusters. China. (Hon. Vicary Gibbs.)

***Berberis diaphana.** (*Pl. Wils.* i. 353.) H. The correct name of the plant included in the 1908 list as *B. yunnanensis*.

Berberis Francisci-Ferdinandi. (*M. D. G.* 1913, 266; *Pl. Wils.* i. 367.) H. Shrub, 6½–10 ft. high. Shoots

reddish. Leaves mostly in fascicles of 6, ovate to ovate-lanceolate, ¾–3 in. long, ½–1¼ in. broad, bright green. Flowers yellow, 3½–4½ lin. across, arranged in elongated paniculate racemes. Fruits scarlet, ovoid or ellipsoid, ½ in. long. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Berberis levis.** (*Pl. Wils.* i. 360; *Lemoine Cat.* 1913–14, n. 185, 6.) H. An evergreen shrub about 5 ft. high, with strong tripartite spines up to 1¾ in. long. Leaves lanceolate, large, slightly spiny, very shining, dark green above, yellowish-green beneath. Panicles 15–40-flowered. Flowers sulphur-yellow. Fruits blue-black. Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

***Berberis pruinosa.** (*M. D. G.* 1913, 266.) H. A freely branched spreading shrub. Leaves many together in fascicles, roundish-ovate, up to 2 in. long and 1¼ in. broad, spiny toothed, whitish beneath; petiole short. Inflorescence up to 6-flowered. Peduncle 1 in. long. Corolla 4–5 lin. across, pale golden-yellow. Yunnan, China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Berberis Rehderiana. (*Späth Cat.* 1913-14, No. 158, 82.) H. A densely branched shrub with rather small obovate light green leaves on brown-red branches. Flowers small, yellow suffused with red. Fruits small, scarlet. Origin unknown. (L. Späth, Berlin.)

***Berberis Sargentiana.** (*Pl. Wils.* i. 359.) H. An evergreen shrub, 4–6½ ft. high, furnished with brownish 3-fid spines up to 1 in. long. Leaves ovate-oblong or ovate-lanceolate, spiny toothed, up to 5½ in. long and 1¼ in. broad. Flowers 2–6, in fascicles, pale yellow, about ½ in. across. Fruits black, ovate-globose, up to ⅓ in. long. Central China. (Arnold Arboretum.)

***Berberis Silva-Taroucana.** (*Pl. Wils.* i. 370; *M. D. G.* 1913, 266.) H. Shrub, 10 ft. high. Branchlets at first brownish, later grey. Leaves mostly in fascicles of 6, oblong-lanceolate or obovate-oblong, entire or toothed, about 2 in. long and 1½ in. broad. Inflorescence loosely racemose, up to 12-flowered. Flowers yellow, rather small. Fruits ovoid-globose, red. Western China. (Arnold Arboretum; H. G. Hesse, Weener, Hanover.)

***Berberis subcaulialata.** (*G. C.* 1913, liv. 335; *M. D. G.* 1913, 266.) H. Very similar in general aspect to *B. Stapfiana*, but distinguished by its distinctly angled branchlets, larger leaves, and translucent yellowish-green fruits, suffused with red. See *Fedde, Repert.* vi. 267. Tibet and Western China. (M. L. de Vilmorin, Les Barres, France; Hon. Vicary Gibbs.)

Bomarea alpicola. (*K. B.* 1913, 188.) Amaryllidaceae. G. Allied to B. *Caldasiana*, but it is much smaller in all its parts, the flowers being only a quarter of the size, and it has a denser pubescence. Columbia. (F. Sander & Sons.)

Bomarea Mooreana. (*K. B.* 1913, 190.) G. A new species, and the smallest yet described. Stem twining, 1 ft. long or more. Leaves shortly petiolate, lanceolate or ovate-lanceolate, long-acuminate, 3 in. long, 7½ lin. broad. Peduncles about 6, 2–3 in. long, 1–3-flowered. Flowers tubular, pendulous, white in the dried state, with rose tips and veins. Sepals ligulate, 7 lin. long. Petals sub-pandurate, nearly 1 in. long. Origin unknown. (Glasnevin B. G.)

Brassocatlaelia amabilis. (*O. W.* iii. 275.) Orchidaceae. G. Garden hybrid between *Brasso-laelia Helen* and *Laelio-cattleya Martinetii*. (F. Sander & Sons.)

Brassocatlaelia excelsior. (*O. W.* iii. 213.) G. Garden hybrid between *Laelio-cattleya George Woodhams* and *Brassavola Digbyana*. (Armstrong & Brown.)

Brassocatlaelia Leonardi. (*O. R.* 1913, 87.) G. Garden hybrid between *Brasso-laelia Helen* and *Cattleya Mossiae*. (Ch. Maron, Brunoy, France.)

Brassocatlaelia nola. (*O. W.* iii. 112.) G. Garden hybrid between *Brassavola nodosa* and *Laelio-cattleya callistoglossa*. (J. & A. McBean.)

Brassocatlaelia vindobonensis. (*O. G. Z.* 1913, 91, as *Brasso-laelio-cattleya*.) G. Garden hybrid between *Laelio-cattleya Erzherzogin Maria* and *Brassavola Digbyana*. (Schönbrunn Hofgarten.)

Brasso-cattleya albanensis. (*G. C.* 1913, liv. 92.) Orchidaceae. S. Garden hybrid between *Cattleya Aclandiae* and *Brassavola Digbyana*. (F. Sander & Sons.)

Brasso-cattleya Alexandrae. (*J. H. F.* 1913, 758.) S. Garden hybrid between *Brasso-laelia Helen* and *Cattleya aurea.* (Ch. Maron & Son, Brunoy, France.) [*Brasso-catlaelia.*]

Brasso-cattleya Dietrichiana. (*O. R.* 1913, 87; *G. C.* 1913, liii. 66.) G. Garden hybrid between *Cattleya Fabia Vigeriana* and *B.-c. Leemanniae.* (Ch. Maron, Brunoy, France.)

Brasso-cattleya fulgens. (*O. W.* iii. 150.) G. Garden hybrid between *Cattleya Maggie Raphael* and *Brassavola Digbyana.* (F. Sander & Sons.)

Brasso-cattleya Linneiana. (*O. G. Z.* 1913, 91.) G. Garden hybrid between *Cattleya Bowringiana* and *B.-c. Lindleyana.* (Schönbrunn Hofgarten.)

Brasso-cattleya Mariliana. (*O. W.* iii. 140.) G. Garden hybrid between *B.-c. Mariae* and *Cattleya Percivaliana.* (F. C. Puddle.)

Brasso-cattleya Matthewsii. (*G. C.* 1913, liv. 358; *O. W.* iv. 63.) G. Garden hybrid between *B.-c. Digbyano-Warneri* (=*B.-c. Mariae*) and *Cattleya Hardyana.* (F. J. Hanbury.)

Brasso-cattleya Mendelosa. (*O. W.* iii. 213.) G. Garden hybrid between *Brassavola nodosa* and *Cattleya Mendelii.* (J. & A. McBean.)

Brasso-cattleya mirabilis. (*O. W.* iii. 213.) G. Garden hybrid between *Cattleya Mendelii* and *B.-c. Mrs. J. Leemann.* (F. Sander & Sons.)

Brasso-cattleya Pittiana. (*O. R.* 1913, 332.) G. Garden hybrid between *Cattleya Whiteleyae* and *B.-c. heatonensis.* (H. T. Pitt.)

Brasso-cattleya schoenbrunnensis. (*O. G. Z.* 1913, 91.) G. Garden hybrid between *Cattleya Bowringiana* and *Brassavola cordata.* (Schönbrunn Hofgarten.)

Brasso-laelia Jacquiniana. (*O. G. Z.* 1913, 91, as *B.-l. Jaquiniana.*) Orchidaceae. G. Garden hybrid between *Brassavola glauca* and *Laelia cinnabarina.* (Schönbrunn Hofgarten.)

Brasso-laelia Ridolphiana. (*B. T. O.* 1913, 11, t. 1.) G. Garden hybrid between *Laelia purpurata* and *Brassavola Digbyana.* (G. B. Ridolfi, Galluzzo, Florence.) [A form of *B.-l. Veitchii.*]

Buddleia macrostachya yunnanensis. (*Bees, Cat.* No. 41, 1913, 6, f.) Loganiaceae. H. Young leaves and the under side of the old ones covered with a silvery white woolly tomentum, which is also present on the inflorescence up to the base of the flowers. Flowers a delicate mauve, fragrant, in rather stiff erect spikes. Yunnan, China. (Bees, Ltd.)

Bulbophyllum patens. (*G. C.* 1913, liii. 363.) Orchidaceae. S. A pretty species with a scandent habit. Pseudobulbs small, each bearing a solitary leathery elliptic leaf. Flowers with a clove-like scent, about 1 in. across, produced singly from the rhizomes, on peduncles 1 in. long; they are firm in texture, yellowish, closely spotted with red; lip fleshy, linear, crimson. Borneo. (Hon. N. C. Rothschild.)

Calanthe Laselliana. (*G. C.* 1913, liii. 89.) Orchidaceae. S. Garden hybid between *C. oculata gigantea* and *C. McWilliamii.* (G. McWilliam, Boston, Mass., U.S.A.)

Calanthe schoenbrunnensis. (*O. G. Z.* 1913, 91.) S. Garden hybrid between *C. vestita* var. *Regnierii Sanderiana* and *C. vestita* var. *rubro-oculata.* (Schönbrunn Hofgarten.)

Calanthe Siebertiana. (*Orchis*, 1913, 35, f. 6.) S. Garden hybrid between *C. Veitchii* and *C. cardioglossa.* (Frankfort Palm Garden.)

Calanthe violacea. (*K. B.* 1913, 29). S. A new species, distinguished from *C. Masuca* by its narrower and recurved bracts and by having the lateral lobes of the lip divaricate and smaller than the middle lobe. The flowers are showy, with the sepals and petals light purple and the lip violet-purple, becoming brownish as it fades; crest yellowish-brown. Madagascar. (Charlesworth & Co.)

Calanthe Whitinae. (*G. C.* 1913, liii. 89.) S. Garden hybrid between *C. Sandhurstiana* and *C. Whitineana.* (G. McWilliam, Boston, Mass., U.S.A.)

Calceolaria Stewartiana. (*G. M.* 1913, 936.) Scrophulariaceae. G. Garden hybrid between *C. rugosa* and *C. hybrida.* (Arnold Arboretum.)

Campanula fragilis alba. (*G. C.* 1913, liv. 217.) Campanulaceae. H. Flowers milk-white. (W. Müller, Fratte di Salerno, Italy.)

***Campanula Stevenii nana.** (*G. C.* 1913, liii. 357; *Gard.* 1913, 275, 279, f.) H. Differs from the type in having the flowers quite sessile among the leaves. (R. Prichard.)

Caralluma Burchardii. (*K. B.* 1913, 121.) Asclepiadaceae. G. A new species allied to *C. europea*, but differs in having the corolla-lobes unspotted and densely covered with white hairs on the inside. The rotate corolla is about ½ in. across, white inside, olive-brown outside; lobes ovate, acute, 2 lin. long. Canaries. (O. Burchard, Puerto de Orotava, Tenerife.)

***Catalpa vestita.** (*Veitch, N. H. P.* 1913, 9.) Bignoniaceae. H. "A strong-growing deciduous tree with bright green foliage. Flowers rosy pink." Central China. (J. Veitch & Sons.)

***Catasetum microglossum.** (*B. M.*, t. 8514.) Orchidaceae. S. A new species allied to *C. barbatum*, but differing in the small lip and the crowded erect filaments of the crest. Pseudobulbs fusiform-oblong, 3–4 in. long, 5–6-leaved. Leaves elliptic-oblong, 8–11 in. long. Scapes about 2 ft. long. Flowers about 1 in. long, dull purple, with a yellow lip. Sepals and petals oblong-lanceolate. Peru. (Kew.)

Cattleya Abekeniae. (*O. R.* 1913, 71.) Orchidaceae. G. Garden hybrid between *C. Rothschildiana* and *C. Dowiana Rosita.* (G. H. Müller Abeken, Lange Voorhout, Den Haag, Holland.)

Cattleya bethenivillensis. (*R. H.* 1913, 442; *J. H. F.* 1913, 552.) G. Garden hybrid between *C. Wavriniana* and *C. aurea.* (A. Marcoz, Brunoy, France.)

Cattleya Bristowiana. (*G. C.* 1913, liv. 358.) G. Garden hybrid between *C. F. W. Wigan* and *C. Mossiae.* (Armstrong & Brown.)

Cattleya Dallemagneae. (*T. H.* 1913. 335.) G. Garden hybrid between *C. Mossiae* and *C. Dubuissonae.* (Ch. Sladden, Liége, Belgium.)

Cattleya Hardyana Goodsonae. (*G. C.* 1913, liv. 162.) G. A handsome form with cream-coloured sepals and petals and richly-coloured lip. (H. S. Goodson.)

Cattleya Huegeliana. (*O. G. Z.* 1913, 7, 91.) G. Garden hybrid between *C. Bowringiana* and *C. Eldorado alba.* (Schönbrunn Hofgarten.)

Cattleya Mendelissima. (*O. W.* iii. 183.) G. Garden hybrid between *C. Mendelii* and *C. Lueddemanniana.* (J. & A. McBean.)

Cattleya Mossiae var. **Beyrodtiana.** (*Orchis* 1913, 68, f. 15.) G. Sepals and petals 4½ in. long, the former narrower than is usual in the species, the latter less curved and scarcely undulate on the margin. Expanded part of the lip oval, about 1¾ in. broad, slightly 2-lobed, not in the least crisped on the margin. (O. Beyrodt, Marienfelde, Berlin.)

Cattleya Percimax. (*O. W.* iii. 112.) G. Garden hybrid between *C. Percivaliana* and *C. maxima.* (E. F. Clark.)

Cattleya Pynaerti. (*R. H.* 1913, 237.) G. Garden hybrid between *C. Mendelii* and *C. Lemoinierae.* (Dr. Ballion.)

Cattleya Thomasii. (*G. C.* 1913, liv. 337; *O. W.* iv. 62.) G. Garden hybrid between *C. Bowringiana* and *C. Peetersii.* (F. J. Hanbury.)

***Cereus kewensis.** (*J. R. H. S.* xxxix. 92.) Cactaceae. G. Garden hybrid between *C. MacDonaldiae* and probably *C. nycticalus.* (Kew.)

Cereus marginatus f. **gibbosus.** (*M. K.* 1913, 148, f.) G. A form in which the 6 ribs of the lower part of the stem disappear in the upper part, where they are represented by rhomboid obtuse 4-6-angled short or elongated tubercles. Mexico. (Darmstadt B. G.)

Cereus megalanthus. (*M. K.* 1913, 182.) G. A shrubby epiphyte, with long slender 3-angled branches. Ribs 2½ lin. high. Areolae up to 3 in. apart, small, circular or elliptic. Spines 0–3, scarcely 1 lin. long. Flowers white, about 15 in. long. Peru. (Berlin-Dahlem B. G.)

Cereus trigonodendron. (*M. K.* 1913, 184.) G. Erect, columnar. Branches not very numerous, forming an acute angle with the stem. Ribs 3. Areolae circular, very small, woolly. Spines usually 6, black: central spine up to ¼ in. long, longer than the others. Flowers red, about 4 in. long. Peru. (Berlin-Dahlem B. G.)

Ceropegia Ledgeri. (*K. B.* 1913, 121.) Asclepiadaceae. S. A new species allied to *C. rincaefolia*, from which

it may be distinguished by its glabrous peduncles, purple corolla-tube, and different corona. It is a climbing herb, with glabrous elongate-ovate leaves 1¾–2¾ in. long. Peduncle axillary, umbellately 3- or 4-flowered. Corolla-tube curved, about 1 in. long; lobes erect, about ½ in. long, slightly connate at the apex, dark purple above, pallid below, very minutely purple-dotted. Probably India or Malay Archipelago. (W. Ledger.)

Chaenomeles japonica dolichocarpa. (*M. D. G.* 1913, 321, f.) Rosaceae. H. A form with pear-shaped fruits nearly 3 in. long and 2 in. broad. (G. W. Depken, Oberneuland, Bremen, Germany.) [*Cydonia japonica*, Thunb., var.]

Chamaedorea pumila. (*G. C.* 1913, liii. 294.) Palmae. S. A very small-growing species, flowering when only about a foot high. It resembles *C. tenella* and *C. geonomaeformis*, but is markedly different in the glaucous green of its foliage. Stem slender. Leaves bipartite, about 6 in. broad, elegantly curved, serrate; rachis clothed with floccose hairs. Spadix lateral, with 6 slender drooping branches densely covered with small dark green flowers. Costa Rica. (F. Sander & Sons.) [*C. nana*, N. E. Brown in K. B. 1914, 156. It is quite distinct from the true *C. pumila*, Wendl., in its dwarfer habit, smaller leaves, shorter petioles, &c.]

Cheiranthesimum Cayeuxii. (*R. H.* 1913, 443.) Cruciferae. H. H. A new name proposed for the plant included in the list of 1912 as *Cheiranthus mutallio.*

Cirrhopetalum miniatum. (*K. B.* 1913, 28.) Orchidaceae. S. A new species allied to *C. gracillimum*, but differing in having a shorter scape, larger vermilion-coloured flowers, and the upper sepal and the petals furnished with yellow hairs. Leaves lanceolate-oblong, about 3 in. long. Scape slender, 4 in. long, about 8-flowered. Flowers elongated. Upper sepal ovate, 4 lin. long. Lateral sepals narrowly lineár-oblong, 3–3¾ in. long. Petals obliquely ovate, 2½ lin. long. Lip oblong, recurved, 1¼ lin. long. Annam. (Glasnevin B. G.)

***Cistus Loreti.** (*B. M.* t. 8490.) Cistaceae. H. A natural hybrid between *C. ladaniferus* and *C. monspeliensis*. It has been in cultivation at Kew for a quarter of a century.

***Cladrastis sinensis.** (*K. B.* 1913, 164, t.) Leguminosae. H. A deciduous tree, 50 ft. high or more; branchlets rusty pubescent at the base. Leaves pinnate; leaflets 11-17, oblong or ovate, 1½–5 in. long, up to 1½ in. broad, dark green and smooth above, pubescent on the midrib beneath and on the rachis and short petiolule. Flowers papilionaceous, blush-white, fragrant, ½ in. long, borne in erect pyramidal panicles which are as much as 12 in. long and 9 in. broad. Western China. (J. Veitch & Sons.)

Cleisostoma acuminatum. (*K. B.* 1913, 144.) Orchidaceae. G. A dwarf almost stemless epiphytic herb. Leaves narrowly oblong, 3¾–6 in. long. Scapes about ⅔ in. long, few-flowered. Flowers only 2 lin. long. Sepals and petals yellowish-green, with 1 or 2 large transverse purple blotches. Lip cream-white and yellow. Formosa. (H. J. Elwes.)

Clematis grata var. **grandidentata.** (*Pl. Wils.* i. 266; *M. D. G.* 1913, 266.) Ranunculaceae. H. Easily distinguished from the type by its large coarsely toothed leaflets. Central and Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Clematis lasiandra.** (*Pl. Wils.* i. 322; *M. D. G.* 1913, 266.) H. A fine species with pale green leaves bordered with brown, and flowers varying from nearly white to dark red-purple. The young shoots are red-brown, and, with the flower-buds, are viscid. China and Japan. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Clematis montana var. **Wilsonii** f. **platysepala.** (*Pl. Wils.* i. 334; *M. D. G.* 1913, 266.) H. Distinguished by its broadly obovate rounded or truncate sepals. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Clematis nutans** var. **thyrsoidea.** (*Pl. Wils.* i. 324; *M. D. G.* 1913, 266.) H. This is the plant included in the list of 1910 as *C. nutans*. It differs from the type in its broadly ovate leaflets, usually cordate at the base, silky pubescent below and with more prominent veins. Western China. (Arnold Arboretum.)

***Clematis tangutica** var. **obtusiuscula.** (*G. C.* 1913, liv. 94; *G. M.* 1913, 602.) H. Leaves similar to those of the type. Flowers nearly

globular, ½–¾ in. across, golden-yellow, mostly solitary on stiff peduncles 4–5 in. long. Sepals 4, curiously and sharply folded at the margin, glossy on the inner surface. West Kansu, China. (F. C. Stern.)

***Clerodendron Bakeri.** (*B. M.* t. 8474.) Verbenaceae. S. Shrub, 4 ft. high. Leaves oblong- or obovate-elliptic, long-acuminate, coarsely toothed, 3½–8 in. long, 2–4 in. broad. Cymes axillary, peduncled, densely many-flowered, about 5 in. across. Flowers white. Corolla-tube slender, 1¼–1⅓ in. long; lobes spreading, elliptic, ¼–⅓ in. long. Filaments much exserted. West Tropical Africa. (Kew.)

***Codonopsis meleagris.** (*G. M.* 1913, 218, f.; *N. B. G. Edinb.* v. 172; *Bees, Cat.* No. 41, 1913, 6, f.) Campanulaceae. H. Stem erect, 9–18 in. high, scarcely leafy except at the base. Leaves very shortly petiolate, oblong, 2–3¼ in. long, ⅔–1¼ in. broad. Flower terminal, solitary, pendulous. Corolla light porcelain-blue or greenish-yellow, chocolate-veined and -spotted, campanulate, 1¼–1½ in. long, 1½–1¾ in. across at the apex. Western China. (Bees, Ltd.)

***Codonopsis subglobosa.** (*N. B. G. Edinb.* viii. 108.) H. A scandent plant growing 6–12 in. high. Leaves opposite or alternate, broadly ovate, 5–7½ lin. long, 4–5 lin. broad, serrulate or almost entire. Flowers terminal, on peduncles 2–6 in. long. Corolla globose-campanulate, green, blotched with maroon at the base; tube about ¾ in. long; lobes broadly triangular, 2½–5 lin. long. Yunnan, China. (Bees, Ltd.)

Coelogyne albanense. (*O. W.* iii. 254.) Orchidaceae. S. Garden hybrid between *C. pandurata* and *C. Sanderiana.* (F. Sander & Sons.)

Coelogyne intermedia. (*G. C.* 1913, liii. 62; *O. R.* 1913, 66, 72.) S. Garden hybrid between *C. cristata Lemoniana* and *C. Massangeana.* (J. Cypher & Sons.)

***Corylopsis platypetala** var. **levis.** (*Pl. Wils.* i. 427; *M. D. G.* 1913, 266.) Hamamelidaceae. H. Distinguished from the type in the absence of glands and in having the year-old branches brown or dusky brown. The capsules are slightly smaller and glaucescent. Western Szechuan, China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Corylopsis Willmottiae.** (*Pl. Wils.* i. 425.) H. A new species included in the list of 1912 under the erroneous name of *C. multiflora*, which differs in having entire (instead of bifid) nectaries and an indistinctly toothed calyx. In *C. Willmottiae* the calyx is glabrous and its teeth are about ½ lin. long. Leaves hairy on the veins only. Flowers bright yellow, very fragrant. Ovary glabrous. Western Szechuan, China.

***Corylus Jacquemontii.** (*K. B.* 1913, 163, t.) Cupuliferae. H. A vigorous-growing tree very closely allied to *C. Colurna*, but its leaves are larger (sometimes 8 in. long and 5 in. broad), more strictly obovate, and more conspicuously lobed towards the apex, and its involucres are merely pubescent, the gland-tipped bristles of those of *C. Colurna* being absent or few and scattered. N.W. India. (Kew.)

***Cotoneaster Henryana.** (*Pl. Wils.* i. 174; *M. D. G.* 1913, 268.) H. A new species differing from all the forms of *C. salicifolia* to which it is closely allied by its much larger leaves, pubescent on both sides and of a softer texture, and by its densely villous branches and ovoid fruits. It is the same as *C. rugosa* var. *Henryana*, Schneider, but appears to be distinct from *C. rugosa* var. *Henryi* of the 1908 list. Central and Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Cotoneaster horizontalis var. **perpusilla.** (*Pl. Wils.* i. 155; *G. C.* 1913, liv. 226.) H. "A compact-growing form, the branches forking freely and making a mound of glossy foliage a foot high and 3 ft. across." Central China. (Hon. Vicary Gibbs.)

***Cotoneaster salicifolia.** (*Veitch, N. H. P.* 1913, 9.) H. A semi-evergreen shrub, with pendulous young growths. Leaves ovate-acuminate, deep green. Flowers white, in corymbs. Fruits scarlet. Western China. (J. Veitch & Sons.)

Cotoneaster salicifolia glaciosa. (*Veitch, N. H. P.* 1913, 9.) H. An evergreen variety, with a graceful drooping habit. Leaves small, lanceolate, deep green. Fruits deep red. Western China. (J. Veitch & Sons.)

***Cotyledon glandulosa.** (*K. B.* 1913, 300.) Crassulaceae. G. A small branched herb clothed everywhere

except the inside of the corolla with minute gland-tipped hairs. Leaves crowded, subterete or club-shaped, 5–12 lin. long. Peduncle terminal, erect, 2½ in. long, cymosely 4–5-flowered at the apex. Flowers somewhat nodding. Corolla dingy green and red; tube cylindric, 2¾ lin. long; lobes lanceolate, recurved-spreading, 5 lin. long. Northern Rhodesia? (Kew.)

***Crassula erosula.** (*K. B.* 1913, 300.) Crassulaceae. G. A new species allied to *C. canescens*, but easily distinguished from it by its glabrous leaves. An almost stemless herb. Leaves very close together, sub-obovate, lanceolate or linear-lanceolate, ½–1½ in. long. Peduncle up to 8½ in. high. Flowers sessile in small crowded capitate cymes, about 2 lin. long, white. Little Namaqualand. (Kew.)

Crataegus peregrina. (*Sargent, T. & S.* ii. 235, t. 191.) Rosaceae. H. A shrubby tree 13–16¼ ft. high, armed with straight slender spines 7½–10 lin. long. Leaves ovate, slightly doubly serrate, divided into 5 or 6 pairs of narrow lobes. Corymbs 15–20-flowered. Flowers about ¾ in. across. Stamens 20; anthers pale yellow. Fruits dark dull purple, with small pale dots. Country not known. (Arnold Arboretum.)

Crataegus persistens. (*Sargent, T. & S.* ii. 233, t. 190.) H. A low flat-topped tree, armed with numerous stout spines 1¼–2¼ in. long. Leaves lanceolate to oblong-obovate, coarsely often doubly serrate above the middle, 2–2¾ in. long, ¾–1 in. broad, persisting till late in the autumn. Flowers ¾ in. across, 12–15 together in corymbs. Stamens 20; anthers white. Possibly a hybrid between *C. lobata* of the Jardin des Plantes, Paris, not of Bosc, and a species of the *Crus-galli* group. (Arnold Arboretum.)

***Crinum Prainianum.** (*G. C.* 1913, liv. 217.) . Amaryllidaceae. G. Garden hybrid. Parents not recorded, but *C. yemense* is apparently one of them. (W. Müller, Fratte di Salerno, Italy.)

Crinum Tremaynianum. (*G. C.* 1913, liv. 217.) G. Garden hybrid. Parents not recorded. (W. Müller.)

Crocus candidus sulphureus. (*Gard.* 1913, 118.) Iridaceae. H. A yellow-flowered variety. (E. A. Bowles.)

Crocus Imperati nucerensis. (*G. C.* 1913, liii. 82.) H. A form with pure white flowers. Mt. San Pantaleone, Nocera, Italy. (W. Müller.)

***Crotalaria agatiflora.** (*G. C.* 1913, liv. 162; *B. M.* t. 8505.) Leguminosae. G. Shrub, about 3 ft. high. Leaves 3-foliolate; leaflets ovate, acute, 1–2¾ in. long, ⅔–1¼ in. broad. Racemes terminal, 8–14 in. long. Flowers pale greenish-yellow, dull brownish-purple on the tip of the keel, about 1½ in. long. East Tropical Africa. (Ingham Whitaker.)

***Cupressus Lawsoniana Fletcheri.** (*G. C.* 1913, liii. 357.) Coniferae. H. A slow-growing erect densely-branched little plant, with purplish branchlets and spreading grey foliage. Originated as a sport. (Fletcher Bros.)

Cycnoches Cooperi. (*K. B.* 1913, 143; *G. C.* 1913, liii. 30, 46; *O. R.* 1913, 261.) Orchidaceae. S. Differs from *C. pentadactylon* chiefly in colour. The showy fragrant flowers have light mahogany-brown sepals and petals, broader whitish side lobes to the lip, and a dull purple column. S. Peru. (F. Sander & Sons.)

Cycnoches Forgetii. (*O. R.* 1913, 255.) S. Differs from *C. peruvianum* in the absence of purple spots on the sepals and petals and in the rather short broadly oblong segments of the lip. The sepals and petals are light green with a suffusion of pale reddish-brown, and the lip is dull glaucous green. (F. Sander & Sons.)

Cymbidium schoenbrunnensis. (*O. G. Z.* 1913, 91.) Orchidaceae. S. Garden hybrid between *C. Tracyanum* and *C. giganteum*. (Schönbrunn Hofgarten.)

***Cyperus adenophorus.** (*M. G. Z.* 1913, 565, ff.) Cyperaceae. G. A densely tufted plant. Leaves dark green, stiff, linear-lanceolate, somewhat arched, up to 1¾ ft. long, about 5 lin. broad. Flowering-stems up to about 3 ft. high, terminating in irregular umbel-like branched inflorescences 12–16 in. across, with bracts about 1¾ ft. long. Brazil. (Haage & Schmidt, Erfurt, Germany.)

Cypripedium bourtonense. (*G. C.* 1913, liv. 449, 454, f. 158.) Orchidaceae. S. Garden hybrid between the Harefield Hall variety of *C. insigne* and *C. Blanche Moore*. (G. F. Moore.) [*Paphiopedilum.*]

Cypripedium broadoaksiense. (*O. R.* 1913, 100, 136.) S. Garden hybrid between *C. Hitchinsiae* and *C. Niobe.* (F. Wrigley.) [*Paphiopedilum.*]

Cypripedium Fouldsianum. (*G. C.* 1913, liii. 14; *O. R.* 1913, 38.) S. Garden hybrid between *C. Fascinator* and *C. Clinkaberryanum.* (J. H. Craven.) [*Paphiopedilum.*]

Cypripedium Hanburyanum. (*G. C.* 1913, liv. 449.) S. Garden hybrid. Its parents are stated to be *C. Leeanum giganteum* and *C. Maudiae,* but no trace of the latter can be detected. (F. J. Hanbury.) [*Paphiopedilum.*]

***Cytisus Andreanus prostratus.** (*G. C.* 1913, liii. 357.) Leguminosae. H. A form of *C. scoparius* var. *Andreanus* with a prostrate habit. (L. R. Russell.)

***Cytisus supranubius.** (*B. M.* t. 8509; *G. C.* 1913, liv. 121, 161, ff. 49-50.) H. at Glasnevin. A quick-growing shrub, forming a bush 8 ft. high or more. Branches rather stout, erect. Leaves deciduous, 3-foliolate, with petioles $\frac{1}{6}$ in. long; leaflets linear-lanceolate, usually about $\frac{1}{8}$ in. long, pubescent. Flowers lateral, small, creamy white, having an almond-odour. Pod about $\frac{3}{4}$ in. long, usually 1-seeded. Canaries. (Glasnevin B. G.)

***Delphinium likiangense.** (*Bees, Cat.* No. 41, 1913, 6.) Ranunculaceae. H. Rather taller than *D. chinense,* and not so heavy in appearance as *D. formosum.* Flowers a bright *Salvia*-blue, rather large, freely produced on strong erect stems. Western China. (Bees, Ltd.) [*D. likiangense,* Franch.]

Delphinium Van der Weyeri. (*G. C.* 1913, liv. 55.) H.H. Flowers few, sweet-scented, pure white, nearly 2 in. across. British East Africa. (Van der Weyer.) [This appears to be *D. candidum,* Hemsl.; B. M. t. 8170.]

Dendrobium ferrierense. (*J. H. F.* 1913, 155.) Orchidaceae. S. Garden hybrid between *D. nobile nobilius* and *D. splendidissimum* (C. Schwarz, Ferrières-en-Brie, Seine and Marne.)

Dendrobium fuscescens. (*G. C.* 1913, liii. 76; *O. R.* 1913, 103.) S. Pseudobulbs ovoid or ellipsoid, $\frac{1}{2}$–$1\frac{1}{2}$ in. long. Leaves petiolate, elliptic, linear- or oblong-lanceolate, 2–4 in. long. Flowers brown. Sepals 1–2 in. long. Petals shorter, very narrow. Lip with oblong side lobes and orbicular-ovate middle lobe. (See *Hook f. Fl. Brit. Ind.* v. 712.) Sikkim, Himalaya. (J. O'Brien.)

Dendrobium Harrisonii. (*O. W.* iii. 213.) S. Garden hybrid between *D. nobile nobilius* and *D. Dominianum.* (C. Alwyn Harrison.)

Dendrobium Luegerianum. (*O. G. Z.* 1913, 91.) S. Garden hybrid between *D. nobile* and *D. Leechianum.* (Schönbrunn Hofgarten.)

Dendrobium microglaphys. (*O. R.* 1913, 301.) S. Similar to *D. aduncum.* Stems about 6 in. high. Leaves ligulate, acuminate. Racemes short. Flowers over $\frac{3}{4}$ in. long, with a heliotrope-like fragrance. Sepals and petals white. Lip purple at the base, light yellow at the apex, and with 5 purple lines in the centre. Mentum saccate, obtuse, $\frac{1}{4}$ in. long. A re-introduction. Borneo. (Sir Marcus Samuel.)

Dendrobium schoenbrunnensis. (*O. G. Z.* 1913, 91.) S. Garden hybrid between *D. nobile* and *D. luteolum.* (Schönbrunn Hofgarten.)

***Dendrocolla Pricei.** (*K. B.* 1913, 144.) Orchidaceae. G. An epiphytic herb. Stem short. Leaves lanceolate-oblong, $1\frac{1}{4}$–2 in. long, $3\frac{1}{2}$–$4\frac{1}{2}$ lin. broad. Scapes very slender, 2–$2\frac{1}{2}$ in. long. Flowers semipellucid white, with transverse brown bars on the sac of the lip, and orange blotches on the side lobes and an orange apex to the crest. Sepals 3–4 lin. long. Petals and lip 3 lin. long. Formosa. (Kew.)

***Deutzia compacta.** (*K. B.* 1913, 264.) Saxifragaceae. H. A new species allied to *D. rubens,* but distinguished by its many-flowered compact inflorescences and smaller flowers. Leaves lanceolate or oblong-lanceolate $\frac{3}{4}$–2 in. long, $\frac{1}{3}$–$\frac{3}{4}$ in. broad, sharply serrulate, sparingly clothed on both sides with white stellate hairs. Inflorescences corymbiform. Petals white, suborbicular, 2 lin. across. China. (Kew; Glasnevin B. G.)

Deutzia crenata eburnea. (*Lemoine Cat.* 1913-14, No. 185, 5, 30.) H. Garden hybrid between *D. crenata candidissima plena* and *D. Vilmorinae.* Other forms of this hybrid are described in the same catalogue as *D. crenata insignis, D. crenata longi-*

petala, and *D. crenata superba*. (V. Lemoine & Son, Nancy.)

Deutzia discolor fasciculata. (*Lemoine Cat.* 1913-14, No. 185, 31.) H. Garden hybrid between *D. scabra* and *D. purpurascens*. (V. Lemoine & Son, Nancy.)

Deutzia glomeruliflora. (*M. G. Z.* 1913, 16; *Lemoine Cat.* 1913-14, No. 185, 30.) H. Similar to *D. discolor*, but is distinguished from that and allied species by having only 4- to 6-rayed hairs on the under side of the leaves. Flowers white, 7½–10 lin. across, in rather small but numerous umbel-like panicles. Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

Deutzia Schneideriana var. **laxiflora.** (*M. G. Z.*, 1913, 8.) H. Near *D. scabra*, but the leaves are sharply toothed and thickly covered beneath, except on the nerves, where the hairs are simple, with stellate hairs, and the panicles are broad. In this variety the panicles are broadly pyramidal, 2½–3¾ in. long, 2–3⅓ in. broad, and are rather lax. Central China. (Arnold Arboretum.)

Dia-laelia langleyensis. (*O. W.* iii. 112.) Orchidaceae. G. Garden hybrid between *Diacrium bicornutum* and *Laelia purpurata*. (J. Veitch & Sons.)

Diervilla florida var. **venusta.** (*M. D. G.* 1913, 263.) Caprifoliaceae. H. Distinguished as a variety by the smaller leaves, glabrous except for the densely villous midrib beneath, smaller calyx, and the slender corolla-tube. Corea. (Arnold Arboretum.)

Diervilla japonica var. **sinica.** (*M. D. G.* 1913, 264.) H. Differs from the type chiefly by the longer petioles, leaves softly pubescent beneath, and by the corolla-tube being abruptly enlarged about the middle. Central China. (Arnold Arboretum.)

***Diospyros armata.** (*K. B.* 1913, 165.) Ebenaceae. H. A slow-growing deciduous shrub of sturdy habit. Branchlets occasionally terminated by a spine. Leaves oval to more or less obovate, 1–2½ in. long, ½–1¼ in. broad; petiole ⅛ in. long or less, pubescent. Flowers unknown. Fruit globose, ¾ in. across, borne on a stalk ½ in. long. Central China. (J. Veitch & Sons.)

***Dischidia Micholitzii.** (*K. B.* 1913, 357.) Asclepiadaceae. S. A new species near *D. acuminata*. Leaves elliptic or elliptic-ovate, abruptly acuminate, rounded at the base, 1–1½ in. long. Umbels axillary, many-flowered. Corolla small, urn-shaped, flesh-coloured, with purple stripes. Probably Burma. (Kew.)

Draba alpina var. **involucrata.** (*N. B. G. Edinb.* viii. 121.) Cruciferae. H. Distinct in habit from typical *D. alpina*. The older parts of the stem form a dense weft at the summit of which are the numerous short shoots of the year, usually only 5 lin. high. Leaves rosulate, forming a kind of involucre round the contracted inflorescence. Yunnan, China. (Edinburgh B. G.)

Dracaena regalis. (*G. C.* 1913, liii. 295. Liliaceae. S. A form of *Cordyline terminalis* somewhat resembling *D. Baptistii*, but it is more elegant and the leaves are bright green with salmon-pink stripes and margins. Fiji Islands. (F. Sander & Sons.)

Dracaena tricolor. (*M. G. Z.* 1913, 522, f.). S. Leaves rather broad, the lowest green, the middle green with a narrow yellow margin or half green and half rose, the youngest red and yellow. (L. J. Draps-Dom, Laeken, Brussels.)

***Dracocephalum bullatum.** (*G. C.* 1913, liii. 426; *Bees, Cat.* No. 41, 1913, 7.) Labiatae. H. Prostrate in habit. Flowers in heads, blue, not so large as in *D. grandiflorum*. Western China. (Bees, Ltd.)

***Dracocephalum tanguticum.** (*Bees, Cat.* No. 41, 1913, 7, f.) H. A bushy plant, 18 in. high or more, with narrow leaves and dense spikes of large violet-purple flowers. Western China. (Bees, Ltd.)

Dryopteris propinqua var. **callensis.** (*R. H.* 1913, 126, ff. 38-39.) Filices. G. Fronds 16–24 in. long, oblong-lanceolate, pinnatisect, dark green, pubescent, especially on the rachis and nerves; lobes ovate-rounded, obtuse, very slightly crenulate, elegantly veined. Algeria. (Algiers B. G.) [Syns. *D. gongylodes* Schk., var. *Nephrodium callense*, Trab.]

Echeveria lutea. (*Fedde, Repert.* xii. 207.) Crassulaceae. G. Basal leaves numerous, ascending, thickish, 3–4 in. long, with a horn-like tip; margins upturned, forming a deep trough. Stem-leaves linear, 1¾–2 in. long. Flowering-stems 8–12 in. long. In-

florescence a secund raceme, 20-flowered or more. Corolla lemon-yellow, ⅔ in. long; lobes distinct for about ⅔ of their length, spreading a little at their tips. Mexico. (Washington B. G.)

Echium simplex × candicans. (*R. H.* 1913, 442.) Boraginaceae. G. Garden hybrid. (G. V. Perez, Puerto Orotava, Tenerife.)

Ephedra Gerardiana sikkimensis. (*Bees, Cat.* No. 41, 1913, 7, as *E. Gerrardiana sikkimensis.*) Gnetaceae. H. A low shrub with thin wiry rush-like stems and inconspicuous unisexual flowers in small spikes or cones. The variety has larger male spikes than the typical form. See *Hook. f. Fl. Brit. Ind.* v. 864. Sikkim and Western China. (Bees, Ltd.)

Epicattleya schoenbrunnensis. (*O. G. Z.* 1913, 91.) Orchidaceae. G. Garden hybrid between *Cattleya Mossiae* and *Epidendrum raniferum.* (Schönbrunn Hofgarten.)

Epidendrum congestum. (*K. B.* 1913, 29.) Orchidaceae. S. A new species differing from *E. discolor* in having smaller pale green flowers. Upper sepal reflexed, ovate, 5 lin. long. Lateral sepals spreading, oblong-lanceolate, 5 lin. long. Petals lanceolate, 4½ lin. long, subrecurved at the apex. Lip adnate to the column; limb cordate-ovate, 2½–3 lin. long. Costa Rica. (Glasnevin B. G.)

Epilaelia schoenbrunnensis. (*O. G. Z.* 1913, 91.) Orchidaceae. G. Garden hybrid between *Epidendrum ciliare* and *Laelia pumila* var. *Dayana.* (Schönbrunn Hofgarten.)

***Eria trilamellata.** (*K. B.* 1913, 141.) Orchidaceae. S. Allied to *E. truncata*, but it is a smaller plant, with glabrous pedicels and a shortly 3-lobed middle lobe to the lip. Pseudobulbs club-shaped, 1¾–3 in. long, 2–3-leaved. Leaves lanceolate or oblong-lanceolate, 1½–2½ in. long. Scape about ¾ in. long, 2-flowered. Bracts light emerald-green. Flowers medium-sized, white, with a light brown front lobe and a very hairy brown keel in front. Siam. (Kew.)

***Erigeron multiradiatus platyphyllus.** (*Bees, Cat.* No. 41, 1913, 7.) Compositae. H. Flower-heads larger than in the type, soft pink. Western China. (Bees, Ltd.)

***Eulophia ugandae.** (*K. B.* 1913, 339.) Orchidaceae. G. Remarkable for its climbing habit. Pseudobulbs subfusiform, superposed, 2–3-leaved, emitting thick roots from the base. Leaves petiolate; limb ovate or elliptic-ovate, 3¼–4½ in. long. Scape 5–8 in. long, bearing a compact many-flowered panicle. Flowers small, white, with a few purple nerves and streaks on the lip and column. Uganda. (Sir Trevor Lawrence.)

Eulophia Watkinsonii. (*K. B.* 1913, 339.) G. Scapes 9–16 in. high. Racemes 2½–5 in. long, 6–12-flowered. Flowers bright yellow, with a little brown on the outside of the sepals, about ⅔ in. long. It differs from *E. hians* mainly in the colour of the flowers. Transvaal and Swaziland. (Kew.)

Euonymus radicans var. **acuta.** (*M. D. G.* 1913, 257.) Celastraceae. H. Leaves thinner than in the type, elliptic or ovate-elliptic, 1¾–2½ in. long, acute or shortly acuminate, with the nerves on the under side conspicuous. Central China. (Arnold Arboretum.) [Syn. *E. japonica* var. *acuta*, Rehder in Pl. Wils. i. 485.]

***Euphorbia Eustacei.** (*K. B.* 1913, 122, f.) Euphorbiaceae. G. A very distinct new species, remarkable among those having a similar habit for its long white spines. The plant has the form of a hemispherical spiny cushion, sometimes as much as a foot in diameter, with pale green cylindric or scarcely tuberculate stems and spreading spines ¾–2 in. long. South Africa. (Kew.)

***Euphorbia Hislopii.** (*K. B.* 1913, 304.) G. A new species very similar to *E. splendens*, but the stems are almost twice as thick, the leaves are sessile and broadly cuneate instead of attenuated at the base, and the peduncles are shorter. Probably Madagascar or the neighbouring islands. (Durban B. G.)

***Euphorbia Pillansii.** (*K. B.* 1913, 122, f.) G. Distinguished from *E. stellaespina* by its stems having much fewer angles, stouter spines, and transverse pale greenish bars, while the involucre is larger. The plant is 4–6 in. high, branched at the base. Stems very obtusely 7-angled. Spines 4–9 lin. long, ¾–1 lin. thick. Peduncles erect, 3–6 lin. long, 1–6-flowered. Involucre 2½–3 lin. across. South Africa. (Kew.)

Forstera Bidwillii. (*Bees, Cat.* No. 41, 1913, 17, as *Fostera.*) Stylidiaceae. H. (?) A prostrate plant with stems 2–8 in. long, densely clothed with small obovate to linear-oblong leaves, the older of which, as well as the young shoots, are covered on the under side with a white felt. Flowers white, with bluish markings, ¼–⅓ in. across, 1–3 together on a peduncle 2–4 in. long. See *Cheeseman, Manual New Zealand Fl.* 393. New Zealand. (Bees, Ltd.)

Forsythia suspensa var. **Fortunei** f. **atrocaulis.** (*M. D. G.* 1912, 193; 1913, 268.) Oleaceae. H. Distinguished by the dark red young branches and the narrow leaves, which are red in a young state. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Fortunearia sinensis.** (*Pl. Wils.* i. 428.) Hamamelidaceae. H. Shrub, 5–6½ ft. high. Leaves obovate or obovate-oblong, shortly acuminate, unequally sinuate-denticulate, 3–6 in. long, 1½–3½ in. broad, glabrescent. Racemes terminal, erect, 1¾–2½ in. long. Flowers similar in structure to those of *Corylopsis*, but the petals are minute, the disc is absent, and the filaments are short. Central China. (Arnold Arboretum.)

Geranium Purpusii. (*Fedde, Repert.* xii. 40.) Geraniaceae. H. (?) A new species of the section *Incanoidea* and belonging to the group of species with 2-flowered peduncles and red flowers. Leaves petiolate, round in outline, 5-partite, with much divided lobes. Peduncles 3–7 in. long. Pedicels ¾–3 in. long. Sepals about ⅓ in. long. Petals broadly obovate, 2 or 3 times longer than the sepals. Mexico. (Darmstadt B. G.)

Gladiolus Masoniorum. (*K. B.* 1913, 305.) Iridaceae. H.H. Differs from *G. sulphureus* in having acuminate spathes and shorter perianth-lobes. The flowers are cream-coloured, pale yellow at the throat and green inside the tube. South Africa. (Cambridge B. G.)

Gladiolus vitriacensis. (*R. H.* 1913, 269, f. 127.) H.H. The name given to a race obtained by crossing a variety of *G. Lemoinei* and some dwarf early-flowering hybrids. (Cayeux & Le Clerc, Paris.)

Gleditschia triacanthos columnaris. (*M. D. G.* 1913, 322.) Leguminosae. H. A fastigiate form. (Lovenjoul Park, near Löwen, Belgium.)

***Habenaria iantha.** (*G. C.* 1913, liv. 300, f. 110.) Orchidaceae. S. A deciduous plant, about 16 in. high, with tuberous roots. Stem erect, fleshy. Leaves several, sessile, amplexicaul, ovate-lanceolate, 2½–3 in. long, soft in texture, pale green. Flowers about 5, shortly stalked. Sepals and petals creamy white; upper sepal hooded, partly enclosing the narrower erect petals; lateral sepals spreading. Lip large, spreading, somewhat wavy on the margin, rose-purple and white, with crimson-purple dots and streaks; crest bright yellow. South India. (F. Sander & Sons.) [*Platanthera iantha*, Wight; *Habenaria jantha*, Hook, f. Fl. Brit. Ind. vi. 164.]

Habenaria Roebelenii. (*G. C.* 1913, liii. 30; *O. R.* 1913, 39.) S. Similar to *H. militaris* but dwarfer in habit, and the vermilion-scarlet flowers have a broader lip, which is deeply cleft at the sides. Annam. (E. H. Davidson; S. W. Flory.)

***Hamamelis vernalis.** (*R. H.* 1913, 131, f. 40; *Sargent, T. & S.* ii. 137, t. 156.) Hamamelidaceae. H. A shrub rarely more than 6½ ft. high, spreading by stolons and flowering from January to March, differing from *H. virginiana* in its time of flowering, the amount and persistency of the pubescence on the leaves and branches, the pale colour of the under side of the leaves, and in the bright red inner surface of the calyx-lobes. Missouri, Arkansas, and Louisiana. (Arnold Arboretum.)

***Helianthus lenticularis** var. **coronatus** × **annuus.** (*G. C.* 1913, liv. 94, 108, f. 44; *G. M.* 1913, 602.) Compositae. H. Garden hybrid. It has been called "The Red Sunflower." (Sutton & Sons.)

***Helichrysum bellidioides.** (*G. C.* 1913, liii. 256, 436, ff. 115, 186.) Compositae. H. or H.H. Stems prostrate, slender, densely leafy. Leaves small, ovate, green above, whitish beneath. Flowering-stems 2–4 in. high, covered by white cottony hairs and bearing narrow bracts. Flower-heads about ½ in across; ray-florets in 2 or 3 rows, white, pointed; disc-florets greenish-yellow. New Zealand. (A. Hemsley; Glasnevin B. G.)

***Hemerocallis Forrestii.** (*N. B. G. Edinb.* v. 298; *Bees, Cat.* No. 41, 1913, 7.) Liliaceae. H. Allied to *H. fulva*, but easily distinguished from it by its narrow perianth with

a remarkably short tube. Plant 12–18 in. high. Leaves 8–14 in. long, ½–⅔ in. broad. Flowers deep reddish-orange. Western China. (Bees, Ltd.)

Huernia Schneideriana. (*M. K.* 1913, 177.) Asclepiadaceae. S. A distinct new species. Stems tufted, about 2 in. high and ½ in. thick, with 6 acutely toothed angles. Flowers rather numerous, arising from the base of the branches. Pedicels short, glabrous. Corolla campanulate, brown, rugose, glabrous, veined, with 5 larger deltoid lobes, ¼ in. long, and 5 much smaller lobes. Corona dusky-purple; interior lobes furnished on the back with a semi-ovate fleshy appendage. Nyasaland. (Berlin-Dahlem B. G.)

Hydrangea villosa. (*R. H.* 1913, 118; *Pl. Wils.* i. 29.) Saxifragaceae. H. A shrub 3–10 ft. high, with stems, petioles and nerves of the leaves carmine. Leaves large, elliptic or oblong-lanceolate, dark green, covered, as well as the petioles, with a thick pubescence. Corymbs convex. Sterile flowers 1¼–1¾ in. across, bluish. Western China. (V. Lemoine & Son, Nancy; Arnold Arboretum.)

***Hypericum Kalmianum.** (*B. M.* t. 8491.) Hypericaceae. H. A much-branched shrub, 1–2 ft. high. Leaves sessile, linear-oblanceolate, ¾–2 in. long, ⅛–⅓ in. broad. Cymes 7–15-flowered. Flowers yellow, ¾ in. across. A re-introduction. The species usually met with in gardens under this name in recent years is *H. prolificum*. *H. Kalmianum* was originally introduced in 1759. North America. (Kew.)

***Ilex yunnanensis.** (*Veitch, N. H. P.* 1913, 4.) Aquifoliaceae. H. A slow-growing evergreen shrub densely furnished with small ovate crenate spineless leaves. Western China. (J. Veitch & Sons.)

Impatiens Herzogii alba. (*J. H. F.* 1913, 413.) Geraniaceae. S. Flowers quite white, 2½ in. across. (Vilmorin-Andrieux & Co., Paris.)

Iris Bolleana. See *I. Persica* var. *Bolleana*.

Iris germanica hyemalis. (*G. C.* 1913, liii. 82.) Iridaceae. H. A winter-flowering form. (W. Müller.)

Iris mesopotamica. (*Dykes, Iris*, 176.) H. Closely allied to *I. cypriana*, from which it differs in its broader leaves, in the spathes which are only slightly scarious in the upper part at flowering time, in the shorter perianth-tube, and in the shorter less prominent beard. Flowers blue-purple with bronze-purple veins, and an almost white beard, which passes to orange on the claw. Mesopotamia. (W. R. Dykes and others.) [Syn. *I. Ricardi*, Hort.]

Iris montana. (*Dykes, Iris*, 91, t. 22.) H. Rootstock a short creeping rhizome. Leaves firm, narrowly sword-shaped, 12–18 in. long, ⅓ in. broad. Stem 18–20 in. high. Spathes usually 2-flowered. Falls narrowly obovate-cuneate, yellow, with lavender veins on a faint lavender ground. Standards oblanceolate, clawed, slightly shorter than the falls, lavender. Western United States. (W. R. Dykes.)

Iris ochroleuca fl. pl. (*J. H. F.* 1913, 336.) H. Perianth-segments white with yellow spots, all similar in shape. Stamens petaloid. (Vilmorin-Andrieux & Co., Paris.)

Iris persica var. **Bolleana.** (*Dykes, Iris*, 190.) H. Flowers pale yellow, not veined, but usually with a purple or violet patch on the blade of the falls, the claws of which have the wings extending almost horizontally, not closely clasping the styles. Cecilian Taurus. (W. R. Dykes; W. Müller, Nocera Inf., Naples.) [Syn. *I. Bolleana*, Siehe; G. C. 1901, xxix. 313; 1913, liii. 82.]

Iris sikkimensis. (*Dykes, Iris*, 134, t. 31.) H. A new name for the plant included in the 1908 list as *I. kumaonensis caulescens*.

***Iris tenuifolia.** (*Dykes, Iris*, 32. H. Rootstock of thin rhizomes, usually growing in crowded tufts. Leaves narrowly linear, 12 in. long, less than ¼ in. broad. Stem usually very short, sometimes up to 6 in. long. Spathes 2-flowered. Falls with a rather short blade and a broad wedge-shaped claw, blue-purple. Standards oblanceolate, about as long as the falls. Eastern Russia to Central China. (W. R. Dykes.)

Kalanchoe sexangularis. (*K. B.* 1913, 120.) Crassulaceae. G. Allied to *K. paniculata*, but very distinct in having a 6-angled stem and superposed cymes in a panicle. It grows about 3 ft. high. Stem simple, straight. Leaves petiolate, the lower elliptic or suborbicular, 3–3¾ in. long, 2–3⅓ in. broad, the upper gradually smaller and narrower.

Panicle 8 in. long. Corolla small, yellow. Transvaal? (Cambridge B. G.)

***Kniphofia gracilis.** (*R. H. B.* 1913, 227, t.) Liliaceae. H.H. The name given to a race obtained by hybridising *K. corallina*, *K. rufa* and *K. Macowani*. (E. H. Krelage, Haarlem.) [Syn. *Tritoma gracilis;* R. H. 1913, 147.]

Koeleria Wilczekiana. (*Fedde, Repert.* xiii, 56.) Graminae. H. Hybrid between *K. hirsuta* and either *K. pyramidata* or a form of *K. gracilis*. (Lausanne University Alpine Garden at Pont de Nant, Switzerland.)

Lactuca Forrestii. (*N. B. G. Edinb.* viii. 112.) Compositae. H. Plant 1–2½ ft. high, erect, robust. Basal leaves petiolate, runcinate, 6–12 in. long, 2–4 in. broad; stem-leaves sessile, runcinate, up to 6 in. long. Flowering-branches numerous, axillary. Flower-heads ovate-oblong, ¾ in. long or more; florets blue, much longer than the involucre. Yunnan, China. (Edinburgh B. G.)

Lactuca funebris. (*N. B. G. Edinb.* viii. 113.) H. A robust plant, reaching a height of 4 ft., with straight erect branches. Lowest and middle leaves petiolate, irregularly and broadly triangular in outline, 3–5-lobed or -fid, 3¾–5 in. long, 3–3¾ in. broad; upper leaves less divided, often almost entire, obovate to linear-lanceolate. Flower-heads numerous; florets about 2½ lin. long, sordid white or pale blue. Yunnan, China. (Edinburgh B. G.)

Laelio-cattleya Armstrongae. (*G. C.* 1913, liv. 358; *O. W.* iv. 6, as *L.-c. Armstrongiae.*) Orchidaceae. G. Garden hybrid between *L.-c. Geo. Woodhams* and *Cattleya Dowiana Rosita*. (Armstrong & Brown.)

Laelio-cattleya aurensis. (*O. W.* iii. 114.) G. Garden hybrid between *Cattleya aurea* and *L.-c. Behrensiana*. (J. & A. McBean.)

Laelio-cattleya Baskettae. (*O. W.* iii. 227.) G. Garden hybrid between *L.-c. eximia* and *Cattleya Schroederae*. (E. F. Clark.)

Laelio-cattleya Cantiana. (*G. C.* 1913, liv. 358; *O. W.* iv. 37.) G. Garden hybrid between *Cattleya Harrisoniana* and *L.-c. Geo. Woodhams*. (Armstrong & Brown.)

Laelio-cattleya Clarkii. (*O. R.* 1913. 278.) G. Garden hybrid between *Cattleya picturata* and *Laelia purpurata*. (E. F. Clark.)

Laelio-cattleya Colmaniae. (*O. R.* 1913, 352.) G. Garden hybrid between *L.-c. callistoglossa* and *Cattleya Hardyana*. (R. Ashworth.)

Laelio-cattleya Ehrenbergiana. (*O. G. Z.* 1913, 92.) G. Garden hybrid between *Cattleya Bowringiana* and *Laelia Perrinii*. (Schönbrunn Hofgarten.)

Laelio-cattleya evershotensis. (*O. W.* iii. 77.) G. Garden hybrid between *Cattleya Forbesii* and *Laelia cinnabrosa*. (E. F. Clark.)

Laelio-cattleya Fleureuae. (*O. W.* iii. 275.) G. Garden hybrid between *Cattleya Loddigesii* and *L.-c. Agnes*. (E. F. Clark.)

Laelio-cattleya Harrianceps. (*O. W.* iii. 112.) G. Garden hybrid between *Cattleya Harrisoniana* and *Laelia anceps*. (J. & A. McBean.)

Laelio-cattleya Imperatrix-Regina. (*O. W.* iii. 213.) G. Garden hybrid between *Cattleya Mendelii* and *L.-c. Martinetti*. (F. Sander & Sons.)

Laelio-cattleya lutea. (*G. C.* 1913, liv. 358.) G. Garden hybrid between *Laelia Latona* and *L.-c. Ophir*. (H. T. Pitt.)

Laelio-cattleya Roezliana. (*O. G. Z.* 1913, 92.) G. Garden hybrid between *L.-c. elegans* var. *Schilleriana* and *Laelia xanthina*. (Schönbrunn Hofgarten.)

Laelio-cattleya salmonea. (*O. W.* iii. 213.) G. Garden hybrid between *L.-c. G. S. Ball* and *L.-c. Latona*. (Mansell & Hatcher.)

Laelio-cattleya Sandhurstiana. (*O. W.* iv. 37, 63.) G. Garden hybrid between *Cattleya Hardyana* and *L.-c. Ophir*. (Armstrong & Brown.) [In *G. C.* 1913, liv. 261, it is stated that the parents of this hybrid are *L.-c. Norba* and *Cattleya aurea*.]

Laelio-cattleya scampstonensis. (*G. C.* 1913, liv. 251.) G. Garden hybrid between *L.-c. La France* and *Cattleya Dowiana aurea*. (W. H. St. Quinton.)

Laelio-cattleya Scherzeriana. (*O. G. Z.* 1913, 92.) G. Garden hybrid between *L.-c. elegans* and *Cattleya Gigas* var. *Sanderiana*. (Schönbrunn Hofgarten.)

Laelio-cattleya schoenbrunnensis. (*O. G. Z.*, 1913, 4, ff. 1–3.) G. Garden hybrid between *L.-c. elegans* var. *Turneri* and *Cattleya aurea*. (Schönbrunn Hofgarten.)

Laelio-cattleya Schroederascens. (*O. W.* iii. 210.) G. Garden hybrid between *Cattleya Schroederae* and *L.-c. highburyensis*. (E. F. Clark.)

Laelio-cattleya Whiteae. (*O. W.* iii. 228.) G. Garden hybrid between *Cattleya Mossiae* and *L.-c. Vinesiae*. (E. F. Clark.)

Leonotis Leonurus var. **globosa nana.** (*Jard.* 1913, 361.) Labiatae. G. A dwarf form, not exceeding $2\frac{1}{3}$ ft. including the inflorescences, with a regular rounded habit of growth. South Africa. (R. de Noter, Bondy, Seine.)

***Ligustrum Prattii.** (*Veitch, N. H. P.* 1913, 4.) Oleaceae. H. A densely leafy evergreen species with a free-branching neat habit of growth. Leaves small, oblong, bright shining green. Flowers white. Western China. (J. Veitch & Sons.)

***Lilium regale.** (*G. C.* 1913, liii. 416, ff. 182-183.) Liliaceae. H. A new species known in gardens as *L. myriophyllum*, and included in the list of 1906 under that name. It differes from the true *L. myriophyllum*, Franch., in the ovoid dark red-purple bulb, less crowded leaves just below the flowers, the lower 1-nerved, the upper usually 3-nerved, horizontally spreading funnel-shaped flowers, moderately long pedicels, and pubescent filaments. Western China.

***Lilium Thayerae.** (*G. C.* 1913, liv. 115, f. 47; *K. B.* 1913, 266.) H. This was introduced into cultivation 7 or 8 years ago, and has been distributed as *L. sutchuenense*, but it is now shown to be distinct from the true *L. sutchuenense*, Franch. Bulb 2–$2\frac{1}{4}$ in. across, ivory-white. Stem 4–$4\frac{1}{2}$ ft. high, green, sometimes noticeably covered by minute white hairs, clothed as densely as *L. pomponium* with long linear leaves, and usually bearing at least 16 or 17 flowers. Pedicels much longer than in *L. sutchuenense* and of a different colour. Western China. (J. Veitch & Sons.)

***Lilium Willmottiae.** (*K. B.* 1913, 266.) H. A new name for the plant included in the list of 1912 as *L. warleyense*.

***Limonia Poggei** var. **latialata.** (*G. C.* 1913, liii. 378, f. 159.) Rutaceae. S. A spinose shrub or small tree, closely resembling some species of *Citrus*, remarkable for the broad leafy wings of the petiole and rachis of its trifoliate leaves. It has appeared in cultivation under the name of *L. Lacourtiana*. Congo Region. (Brussels B. G.; Kew.)

Liparis lacerata. (*G. C.* 1913, liii. 99; liv. 71.; *O. R.* 1913, 100.) Orchidaceae. S. A very pretty species with green conical pseudobulbs, elliptic-lanceolate leaves, and elegant racemes about 8 in. long. Flowers about $\frac{1}{4}$ in. broad. Sepals and petals yellowish, oblong, obtuse. Lip oblong, expanded in front and strongly toothed, orange-red, darkest in the centre. Borneo, &c. (Hon. N. C. Rothschild.)

Liparis nana. (*K. B.* 1913, 28; *O. W.* iii. 147, f.) S. A very small plant, only about $1\frac{1}{2}$ in. high. Leaves 3 or 4, rosulate, ovate-oblong, $\frac{3}{4}$–1 in. long. Scape about $1\frac{1}{2}$ high. Raceme short, subcorymbose. Flowers dark purple, about $\frac{1}{4}$ in. long, remarkable in having a very broad nearly straight column. Annam. (Gurney Wilson.)

***Liquidambar formosana** var. **monticola.** (*Pl. Wils.* i. 422; *G. C.* 1913, liv. 226.) Hamamelidaceae. H. A somewhat smaller tree than the typical form, and differing in having the branchlets and leaves always glabrous, the latter glaucescent beneath and truncate or more rarely subcordate at the base, ornamental in form and colouring. Central China. (Arnold Arboretum; Hon. Vicary Gibbs.)

Lobelia Erinus floribunda fl. pl. (*M. G. Z.* 1912, 602; *G. C.*, 1913, liii. 89.) Campanulaceae. G. Remarkably free-flowering. Flowers double, pure sky-blue. (S. Karrer, Erfurt, Germany.)

Lonicera Henryi hirsuta. (*Bees, Cat.* No. 41, 1913, 9.) Caprifoliaceae. H. More hairy than the type. Western China. (Bees, Ltd.)

Lonicera Maackii var. **podocarpa** f. **erubescens.** (*M. D. G.* 1913. 263.) H. Flowers suffused with rose, larger than in the type. China. (Arnold Arboretum.)

Lychnis Arkwrightii. (*G. C.* 1913, liv. 15, 71.) Caryophyllaceae. H. Garden hybrid between *L. chalcedonica* and *L. Haageana*. (J. S. Arkwright.)

Lysionotus warleyensis. (*G. C.* 1913, liv. 125; *G. M.* 1913, 633.) Gesneraceae. G. A subshrubby plant forming dense little bushes about 9 in. high. Leaves opposite or in whorls of 3, oblong to lanceolate, tapering to a short crimson petiole, irregularly few-toothed, 1½–2 in. long, ¼–½ in. broad, fleshy, almost white beneath. Flowers axillary, solitary, shortly stalked, tubular, white, with 3 purple lines running up the tube, about 2 in. long. China. (Miss Willmott.)

Mammillaria arida. (*M. K.* 1913, 181.) Cactaceae. G. Stem simple, globose, 1¼–2½ in. across. Tubercles almost terete. Radial spines about 15, pallid, occasionally yellowish at the base, dark at the tips; central spines 4–7, 6–8 lin. long, much longer than the radial. Flowers green-yellow, scarcely ½ in. long. Lower California. (Washington B. G.; L. Quehl, Halle a. S., Germany.)

Mammillaria echinoidea. (*M. K.* 1913, 42, 146, 162, 182, f.) G. Allied to *M. Ottonis* and *M. glanduligera*. Stem simple, globose, about 2¼ in. high, slightly depressed at the apex. Tubercles conical, shortly furrowed above, dilated when old. Radial spines 20–25, subulate, up to 7½ lin. long, white, brown at the tips; central spines 1–3, usually 2, about 7½ lin. long. Flowers unknown. Mexico. (F. De Laet, Contich, Belgium; K. Knippel, Klein-Quenstedt, Halberstadt, Germany.)

Mammillaria Thornberi. (*M. K.* 1913, 51.) G. Plant cylindric, usually 2–3 in. high, 1¼ in. across, with 8 or 9 spirally arranged series of tubercles, naked in the axils. Radial spines 13-18, slender, ¼ in. long; central spine more slender, curved, hooked, ¼–¾ in. long. Flowers funnel-shaped, about 1¼ in. long; segments broadly oblong, acute, white, with a flesh-coloured median stripe and bluish-red margins. The species is allied to *M. Grahamii*. Arizona. (K. Knippel, Klein-Quenstedt, Halberstadt, Germany.)

Mandevilla Tweedieana. (*R. H.* 1913, 422, f. 146, as *Mandevillea Tweediana*). Apocynaceae. G. A new species which has been confused with *M. suaveolens*, which it closely resembles. It differs, amongst other characters, in having the branchlets quite glabrous, leaves long-acuminate or almost caudate, longer petioles, lanceolate bracts, more fragrant flowers, lanceolate sepals, and a corolla with a brilliant white limb and green tube, which differs in shape and in the pubescence within. Country doubtful, probably Argentina. (C. Pichaud, Vertou, Nantes.)

Maranta Oppenheimii tricolor. (*M. G. Z.* 1913, 522, f.) Scitamineae. S. Leaves variegated with grey-green, milk-white and red. (J. De Cock, Meirelbeke, Belgium.)

***Maurandia Purpusi.** (*M. G. Z.* 1913, 446, ff.) Scrophulariaceae. H.H. A perennial herb, 12–16 in. high, with ascending pendulous or prostrate leafy, not climbing, stems and tuberous rootstock. Leaves long-petiolate, similar in shape to those of *M. scandens* but somewhat smaller. Flowers axillary, long-pedunculate, like those of *M. scandens*, but more ornamental and of a beautiful purple-carmine colour. South-west Mexico. (M. Herb, Naples.)

***Maxillaria Fletcheriana.** (*G. C.* 1913, liii. 258; *O. R.* 1913, 160.) Orchidaceae. S. A new species intermediate between *M. Sanderiana* and *M. grandiflora* in the form and size of the flower, the broad segments of which more resemble the first-named. Scapes erect, with loose green sheaths. Flowers solitary on each scape, large, cream-white, with thin purple lines. Lip yellow, with some purple markings. Peru. (F. Sander & Sons.)

***Meconopsis chelidonifolia.** (*J. of H.* 1913, lxvi. 149.) Papaveraceae. H. A perennial. Leaves mostly basal, densely hairy, roundish, 3-lobed, the lobes slightly incised; petiole short. Flowering-stems slender, wiry, brownish-black, bearing leaves similar to the basal ones, at first erect, finally becoming prostrate. Flowers borne in the axils of the upper stem-leaves, clear yellow. Western China. (Glasnevin B. G.)

***Meconopsis Delavayi.** (*G. C.* 1913, liii. 357; *G. M.* 1913, 394; *Gard.* 1913, 275, f.) H. A small glabrous plant. Leaves few, long-stalked, ovate to lanceolate, pale green above, glaucous beneath. Peduncles 3 in. long, 1-flowered. Flowers pendulous, large, deep violet. Yunnan, China. (Edinburgh B. G.)

Megaclinium ugandae. (*K. B.* 1913, 338.) Orchidaceae. S. An epiphytic plant. Pseudobulbs tetragonal, conical-oblong, 2 in. long, 2-leaved. Leaves oblong or elliptic-oblong, 3 in. long. Scape about 5 in. long; rachis oblong, 2¾ in. long, heavily dotted and marbled with purple-brown on a light green

ground. Flowers about ¾ in. apart, small. Sepals similar in colour to the rachis. Petals light green. Lip dull purple. Uganda. (Glasnevin B. G.)

***Meliosma Oldhami.** (*K. B.* 913, 166.) Sabiaceae. H. A deciduous tree, attaining a height of 50 ft. Leaves pinnate, 7–15 in. long; leaflets 5-11, the lateral ovate or oval, the terminal obovate and much larger than the lateral, 1–5½ in. long, ¾–2 in. broad, all acuminate and furnished except towards the base with small slender teeth. Inflorescence a terminal panicle, with smaller panicles in the axils of the upper leaves, the whole 8–10 in. long and broad. Flowers very numerous, only about ⅛ in. across, probably creamy white and fragrant. Corean Archipelago and Central China. (J. Veitch & Sons.)

***Mesembryanthemum evolutum.** (*K. B.* 1913, 120.) Ficoideae. G. A very distinct new species which connects those belonging to the group having 2 leaves fused into a small obconical body with those in which there are 3 or 4 free leaves. Densely tufted. Plantlets (or branches) 2–4-leaved, 3–3½ lin. across. Leaves erect, connate at the base, the free part 1–1½ lin. long, semi-globose. Corolla 8 lin. across; petals about 36, 3 lin. long, rose-purple. Little Namaqualand. (Kew.)

***Mesembryanthemum fraternum.** (*K. B.* 1913, 118.) G. Allied to *M. minutum*, but the obconical foliar bodies are dotted and the flowers are smaller. Corolla 7½ lin. across; tube yellow; petals 21-28, linear, a beautiful rose-colour, yellow at the base. Little Namaqualand. (Kew.)

***Mesembryanthemum globosum.** (*K. B.* 1913, 119.) G. A small plant differing from *M. minimum* in having the globose foliar bodies larger, convex at the apex, without dots, and the corolla pale rose, with a shorter tube. Corolla 9–10 lin. across; tube 2½ lin. long; petals 40–55, linear, the outer 4–4½ lin. long, the inner 2½ lin. long. Little Namaqualand. (Kew.)

***Mesembryanthemum minusculum.** (*K. B.* 1913, 118.) G. Allied to *M. minutum*, but the obovoid foliar bodies are convex, purple-spotted, and very minutely white-dotted, with the central area minutely pubescent. Flowers 1 in. across, a beautiful red-purple, with a yellow eye; when once expanded they remain open, regardless of the weather, till they fade in 4 or 5 days. South Africa. (Kew.)

***Mesembryanthemum odoratum.** (*K. B.* 1913, 119.) G. Resembles *M. ficiforme*, but the obconical-obcordate foliar bodies have fewer dots, and the flowers are much larger, with a fragrance very much like that of cloves. Corolla ¾–1 in. across, a beautiful flesh-purple colour; petals about 80, up to 5 lin. long, ½ lin. broad. It has been in cultivation for over 40 years, but has only recently been described. South Africa. (Kew.)

Micromeles Folgerneri pendula. (*Veitch, N. H. P.* 1913, 10.) Rosaceae. H. "A gracefully drooping variety." Central China. (J. Veitch & Sons.)

Miltonia Charlesworthii. (*G. C.* 1913, liii. 351; *O. R.* 1913, 313, f. 60.) Orchidaceae. G. Garden hybrid between *M. vexillaria Memoria G. D. Owen* and *M. Hyeana*. (Charlesworth & Co.)

Miltonia Sanderae. (*G. C.* 1913, liv. 13; *O. R.* 1913, 246, 256, f. 56.) G. Garden hybrid between *M. St. Andre* and *M. vexillaria Memoria G. D. Owen*. (F. Sander & Sons.)

Miltonioda Cooperi. (*G. C.* 1913, liv. 12; *O. R.* 1913, 232.) Orchidaceae. G. Garden hybrid between *Miltonia Warscewiczii* and *Cochlioda Noetzliana*. (F. Sander & Sons.)

***Moraea revoluta.** (*K. B.* 1913, 305.) Iridaceae. G. Allied to *M. spathacea*, from which it differs in having solitary flowers, revolute sepals, and crested styles, which are crossed like the tips of the closed wings of some birds. Flowers bright yellow. Petals oblanceolate, 2½ in. long. Angola. (Kew.)

Mystacidium gracillimum. (*K. B.* 1913, 144.) Orchidaceae. S. Leaves linear-oblong, 2½–3⅓ in. long. Scapes suberect, very slender, 1¾–3 in. long. Flowers semipellucid white, about 3 lin. long excluding the spur, which is 1¾ in. long and very slender. Uganda. (Glasnevin B. G.)

Narcissus minicycla. (*G. C.* 1913, liii. 61.) Amaryllidaceae. H. Garden hybrid between *N. cyclamineus* and *N. minimus*. (H. Chapman.)

Narcissus triandrus albus × cyclamineus. (*G. C.* 1913, liii. 173.) H. Garden hybrid. (H. Chapman.)

Neillia longiracemosa. (*Pl. Wils.* i. 434; *M. D. G.* 1913, 268.) Rosaceae. H. A strong-growing spread

ing shrub, with red young branches and shining dark green leaves. Flowers rose-pink, in racemes from 1¾ to 6 in. long. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Nepenthes atropurpurea. (*G. C.* 1913, liv. 17; *G. M.* 1913, 518.) Nepenthaceae. S. Garden hybrid between *N. sanguinea* and *N. Curtisii superba.* (J. Veitch & Sons.)

Nephrolepis Dreyeri. (*M. G. Z.* 1913, 259.) Filices. S. A form of *N. exaltata*, with a compact habit of growth and shining fronds. (E. Neubert, Wandsbek, Germany.)

Nopalea inaperta. (*M. K.* 1913, 139.) Cactaceae. G. Shrubby, erect, very much branched, 16–23 ft. high. Joints small, obovate. Leaves subulate, spinescent, nearly ½ in. long. Spines very numerous, strong, spreading, usually less than 1 in. long. Flowers red. Fruit small, nearly globose to obovate, red. Mexico. (Missouri B. G.)

Nymphaea virginalis. (*R. H.* 1913, 566.) Nymphaeaceae. H. Apparently of garden origin. It has very large leaves and pure white flowers up to 11 in. across, and is believed to be the hardiest of the Nymphaeas. (E. Latour-Marliac, Temple-sur-Lot, France.)

Odontioda Brewii. (*G. C.* 1913, liv. 13; *O. W.* iii. 255.) Orchidaceae. G. Garden hybrid between *O. Charlesworthii* and *Odontoglossum Harryanum.* (Charlesworth & Co.)

Odontioda daltonensis. (*G. C.* 1913, liii. 242; *O. W.* iii. 184.) G. Garden hybrid between *Odontoglossum Phœbe* and *Cochlioda Noetzliana.* (J. H. Craven.)

Odontioda Hemptinneana. (*O. W.* iii. 275.) G. Garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum eximium.* (F. Sander & Sons.)

Odontioda Mossiae. (*G. C.* 1913, liii. 158; *G. M.* 1913, 241; *O. W.* iii. 151.) G. Garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum maculatum.* (J. S. Moss.)

Odontioda oakwoodiensis. (*G. C.* 1913, liv. 375.) G. Garden hybrid between *O. Bradshawiae* and *Odontoglossum percultum.* (Mrs. N. Cookson.)

Odontioda rawdonensis. (*G. C.* 1913, liv. 226.) G. Garden hybrid between *Odontoglossum ardentissimum* and *Odontioda Charlesworthii.* (Mansell & Hatcher.)

Odontioda Seymourae. (*G. C.* 1913, liv. 162; *O. W.* iv. 37.) G. Garden hybrid between *O. Charlesworthii* and *O. Bradshawiae.* (Armstrong & Brown.)

Odontocidium Edwardatum. (*O. R.* 1913, 189; *O. W.* iii. 149.) Orchidaceae. G. Garden hybrid between *Odontoglossum Edwardii* and *Oncidium serratum.* (J. & A. McBean.)

Odontoglossum amandum. (*G. C.* 1913, liii. 92; *O. R.* 1913, 93.) Orchidaceae. G. Garden hybrid between *O. Pescatorei* and *O. Wilckeanum.* (C. J. Phillips.)

Odontoglossum auriculatum aureum. (*O. W.* iii. 270.) G. Flowers almost entirely yellow. (de Barri Crawshay.)

Odontoglossum crispum excelsior. (*G. C.* 1913, liii. 350.) G. "A superb large white form." (F. Sander & Sons.)

Odontoglossum crispum militaris. (*G. C.* 1913, liii. 316.) G. Flowers of a good round shape, very brightly coloured. (A. Warburton.)

Odontoglossum lawrecrispum. (*O. W.* iii. 151.) G. Garden hybrid between *O. Lawrenceanum* and *O. crispum.* (J. & A. McBean.)

Odontoglossum lucidum. (*O. W.* iii. 213.) G. Garden hybrid between *O. triumphans* and *O. Ossulstonii.* (F. Sander & Sons.)

Odontoglossum luminosum. (*O. W.* iii. 213). G. Garden hybrid between *O. ardentissimum* and *O. Fascinator.* (F. Sander & Sons.)

Odontoglossum maculatorei. (*O. W.* iii. 112). G. Garden hybrid between *O. maculatum* and *O. Pescatorei.* (J. S. Moss.)

Odontoglossum Meredithae. (*G. C.* 1913, liv. 295; *O. W.* iv. 62.) G. Garden hybrid between *O. Rossii rubescens* and *O. venustulum.* (R. G. Thwaites.)

Odontoglossum princeps. (*G. C.* 1913, liii. 158.) G. Garden hybrid between *O. crispum Luciani* and *O. Lawrenceanum.* (F. Sander & Sons.)

Odontoglossum triumphosum. (*O. W.* iii. 184.) G. Garden hybrid be-

tween *O. triumphans* and *O. cirrhosum*. (J. & A. McBean.)

Odontoglossum Wilsonii. (*G. C.* 1913, liv. 358.) G. Garden hybrid between *O. Vuylstekei* and *O. Rolfeae*. (R. G. Thwaites.)

Odontonia brugensis. (*O. R.* 1913, 180.) Orchidaceae. G. Garden hybrid between *Odontoglossum Edwardii* and *Miltonia vexillaria*. (F. Sander & Sons.)

Odontonia Cholletii. (*O. R.* 1913, 177. f. 34.) G. Garden hybrid between *Odontoglossum Harryanum* and *Miltonia vexillaria*. (F. Sander & Sons.)

Odontonia Cleverlyana. (*R. H.* 1913 491; *R. H. B.* 1913, 337.) G. Garden hybrid between *Miltonia vexillaria Leopoldi* and *Odontoglossum Rolfeae*. (O. Fanyau, Hellemmes, Lille, France.)

Odontonia Fanyauana. (*R. H. B.* 1913, 338.) G. Garden hybrid between *Miltonia vexillaria Empress Augusta* and *Odontoglossum Adrianae*. (O. Fanyau. Hellemmes, Lille, France.)

Odontonia Farnesiana. (*G. C.* 1913. liv. 162; *O. W.* iv. 6.) G. Garden hybrid between *Odontoglossum Edwardii* and *Miltonia Warscewiczii*. (F. Sander & Sons.)

***Odontonia Langowoyi.** (*G. C.* 1913, liv. 449; *O. W.* iii. 150, f.) G. Garden hybrid between *Miltonia Schroederiana* and *Odontoglossum Uroskinneri*. (Charlesworth & Co.)

Odontonia MacNabiana. (*G. C.* 1913, liv. 226; *O. W.* iv. 36.) G. Garden hybrid between *Odontoglossum Edwardii* and *Miltonia Bleuana*. (F. Sander & Sons.)

***Omphalodes cappadocica**. (*G. C.* 1913, liii. 192.) Boraginaceae. H. A perennial herb. Leaves somewhat variable in shape, usually cordate-lanceolate, covered with silky hairs and having conspicuous arching veins. Flowers ½ in. across, rich blue, with a small white eye, arranged in loose erect cymes, which rise 6–8 in. from the ground. Asia Minor. (M. Prichard.) [=*O. cornifolia;* G. C. 1913, liii. 380, f. 162.]

Oncidioda bella. (*G. C.* 1913, liii. 427: *O. W.* iii. 228.) *Orchidaceae*. G. Garden hybrid between *Oncidium Marshallianum* and *Cochlioda Noetzliana*. (Charlesworth & Co.)

Oncidium bidentatum. (*K. B.* 1913, 143.) Orchidaceae. G. Pseudobulbs ovoid-oblong, 2–3 in. long. Leaves linear-oblong, 6–7½ in. long. Scapes slender, subflexuose, about 6 ft. long. Panicle elongated, with rather distant subflexuose few-flowered branches. Flowers medium-sized, yellow, with a large amount of brown on the sepals and petals and on the basal half of the lip. Column broad, furnished on each side with an oblong tooth. The species is allied to O. fasciferum. Ecuador. (Mrs. Lipscomb.)

Oncidium cardiochilum. (*O. R.* 1913. 58.) G. A fine species with a large lax branching very flexuose panicle. Flowers numerous, about 1½ in. across. Sepals and petals brown, acuminate. Lip yellow, broad, pandurate, with a rather elongated somewhat tubercled crest. Column-wings practically obsolete. Colombia and Guatemala. (F. Sander & Sons.)

Oncidium McBeanianum. (*G. C.* 1913, liii. 351; *O. W.* iii. 213.) G. Garden hybrid between *O. superbiens* and *O. macranthum*. (J. and A. McBean.)

Onosma Forrestii. (*N. B. G.* Edinb. viii. 107.) Boraginaceae. H. Basal leaves linear-lanceolate or linear-oblanceolate, 4–6 in. long, 5–6 lin. broad; stem-leaves linear, erect, about 4 in. long; all white tomentose. Inflorescence rather dense, very densely covered with whitish stiff hairs. Calyx about 5 lin. long. Corolla scarcely longer that the calyx, narrowly tubular, densely covered with whitish stiff hairs. Yunnan, China. (Bees, Ltd.)

Opuntia spp. (*M. K.* 1913, 130–138. ff.) Cactaceae. G. The following new species, natives of the Southern United States and Mexico, and cultivated in America, are described: *deserta, gorda, icterica, micrarthra, nemoralis, recondita,* and *tribuloides*.

Opuntia De Laetiana. (*B. K.* t. 148.) G. A species of the section *Platyopuntia*, with bright green oblong joints 10 in. long and 3¾ in. broad, narrowed at both ends. Areolae relatively large, furnished with a few strong spines, one of which is usually larger and stronger than the others. Flowers large, deep orange-yellow. Paraguay. (F. De Laet, Contich, Belgium.) [Syn. *O. elata* var. *De Laetiana*, Weber; B.M.H.N. 1904, 392.]

Paederia Wilsonii. (*M. D. G.* 1913, 268.) Rubiaceae. H.H.? A strong-growing climber, with slightly hairy branches. Leaves long petiolate, ovate-lanceolate, up to 6 in. long. Inflorescence somewhat resembling that of the lilac, axillary, up to 6 in. long. Corolla-tube cylindric, 8 lin. long, 2 lin. broad, silver-grey; limb 5–6-lobed, 5 lin. across, cream-white, with a whitish, hairy, purple-red eye. China. (H. A. Hesse, Weener, Hanover.)

***Paeonia Delavayi** var. **angustiloba.** (*G. C.* 1913, liii. 405, f. 169 [as *P. Delavayi*], and liv. 52.) Ranunculaceae. H. Subshrubby, stoloniferous, 2 ft. high or more. Leaves very handsome, 1 ft. long, finely divided, light green above, almost glaucous beneath. Flowers 2 in. across, deep velvety crimson, with yellow stamens. Petals remarkable for their great substance. Typical *P. Delavayi* has broader lobes to the leaves. The species has some resemblance to *P. lutea* except in the colour of the flowers. Western China. (J. Veitch & Sons; Glasnevin B.G.)

Pedicularis siphonantha. (*Gard.* 1913, 297.) Scrophulariaceae. H. Stems 2–10 in. high, erect or ascending. Leaves radical, 2–6 in. long, ¼–1½ in. broad, linear-oblong, pinnatifid or pinnatisect. Flowers axillary and in terminal racemes or heads. Calyx-lobes crested. Corolla red or pink; tube very slender, 3–6 times as long at the calyx. See *Hook. f. Fl. Brit. Ind.* iv. 313. Himalaya, Tibet, Afghanistan. (Bees, Ltd.)

***Pelargonium luteolum.** (*K. B.* 1913. 299.) Geraniaceae. G. A herb with a bulbous rootstock. Leaves 4 or 5, all radical; blade biternately divided, 7–15 lin. long and broad, the ultimate segments linear and acute; petiole 1¾–2½ in. long. Peduncles erect, 1¼–2 in. long. Umbels 3–5-flowered. Petals spathulate, 5 lin. long, pale yellow, each with two red lines at the base. South Africa. (Kew.)

***Pentstemon Davidsonii.** (*G. C.* 1913, liii. 357; *G. M.* 1913, 395.) Scrophulariaceae. H. A very small subshrubby species, only 2 in. high. Leaves round or nearly ovate. Flowers borne singly or in pairs at the end of the shoots, bright rosy crimson. Corolla-tube 1½ in. long. California. (Clarence Elliott.)

***Pentstemon Hartwegii albus.** (*B. T. O.* 1913, 118, f. 15.) H. Flowers at first cream-white, afterwards pure white. (E. Benary, Erfurt, Germany.)

Phaius schoenbrunnensis. (*O. G. Z.* 1913, 92.) Orchidaceae. S. Garden hybrid between *P. grandifolius* and *P. assamicus*. (Schönbrunn Hofgarten.)

Phalaenopsis Berti. (*J. H. F.* 1913, 23.) Orchidaceae. S. Natural hybrid closely resembling *P. amabilis*, which is regarded as one of its parents. (E. Bert, Bois-Colombes, Seine.)

Philadelphus maximus. (*M. D. G.* 1913, 255.) Saxifragaceae. H. Garden hybrid between *P. latifolius* and *P. tomentosus*. (Arnold Arboretum.)

Philadelphus Wilsonii. (*Pl. Wils.* i. 4; *R. H.* 1913, 118; *Lemoine Cat.* 1913-14, No. 185, 36.) H. Shrub, 6–19 ft. high. Leaves ovate-oblong or ovate-elliptic, more or less acuminate, rounded at the base, denticulate, 4–6½ in. long, 2–3¼ in. broad. Racemes 5–6 in. long, 9–11-flowered. Flowers white, about 1½ in. across. Central and Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

***Phoenix andamanensis.** (*G. C.* 1913, liii. 294.) Palmae. S. Somewhat similar to *P. rupicola*, but it is more elegant than any of the larger-growing species, and differs from all those in cultivation by the regularity of its pinnae and the narrowness of its terminal one. The plant has practically no spines. Andaman Islands. (F. Sander & Sons.)

Phyllocactus Victoria-regia. (*B. K.* t. 147.) Cactaceae. G. Garden hybrid. Parentage not stated. It is remarkable for the delicate colours of the flowers, the outer segments of which are dark orange-red, the intermediate various shades of yellow, and the inner pure white. (G. Bornemann, Blankenberg, Germany.)

Picea asperata. (*Pl. Wils.* ii. 22; *M. D. G.*, 1913, 268.) Coniferae. H. Old trees spire-like in appearance. Bark greyish-chestnut, rough, peeling off in thin flakes. Young shoots pale yellowish-grey, changing to brown, finally to grey. Leaves 4-angled, slightly curved, about ⅔ in. long, light green. Cones 3⅓–5 in. long. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Picea pungens Moerheimii. (*M. D. G.* 1913, 321.) H. Distinguished by its more compact growth and the deeper blue of its foliage. (B. Ruijs, Moerheim, Dedemsvaart, Holland.)

***Pinus Malleti.** (*R. H.* 1913, 263, ff. 93-95.) Coniferae. H. Closely allied to *P. ponderosa*, or possibly a variety of that species, differing in having irregular whorls of 2 to 5 branches, each branch inclined at an angle of 45° to the trunk, and very dark green leaves with 7–9 (instead of 5 or 6) rows of stomata. Its cones are at present unknown. (Château des Côtes, Jouy-en-Josas, France.)

Plectranthus ciliatus. (*G. C.* 1913, liv. 455.) Labiatae. G. A showy autumn- and winter-flowering plant with a compact habit. Stem covered with purple hairs. Leaves broad, bright green above, purple-red beneath. Flowers white, with lilac spots. South Africa. (W. Müller, Fratte di Salerno, Italy.)

Podandria macrandra. (*G. C.* 1913, liv. 182, f. 67.) Orchidaceae. S. Plant ¾-1¾ ft. high, apparently evergreen. Leaves radical, 4–7, petioled; blade elliptic-oblong, 2-5 in. long, ¾-2¼ in. broad. Racemes 2 9-flowered. Flowers large, white, with a green tint on the sepals. Dorsal sepal linear-lanceolate, 14 lin. long; lateral sepals linear, 1¼ in long. Petals filiform, 1½ in. long. Lip tripartite, with linear-filiform lobes 7–8 lin. long. See *Fl. Trop. Afr.* vii. 206. West Tropical Africa. (Sir Frank Crisp.)

***Polygonum lichiangense.** (*Bees, Cat.* No. 41, 1913, 9, f.) Polygonaceae. H. A loose bush about 2 ft. high, with oblong acute leaves and cream-white flowers in inflorescences resembling those of *P. baldschuanicum*, produced at nearly every node. Western China. (Bees, Ltd.)

Polypodium Mayi var. **cristatum.** (*G. C.* 1913, liv. 17; *G. M.* 1913, 518.) Filices. S. A form in which the lobes of the fronds are more fringed than in the type and are slightly crested at the tips. (H. B. May & Sons.)

Polystachya coriacea. (*K. B.* 1913, 340.) Orchidaceae. S. An epiphyte, 6–7½ in. high. Pseudobulbs oblong, 1–1¼ in. long, 2-leaved. Leaves linear-oblong, 4–5¾ in. long. Scape 3–3¾ in. long. Racemes 1¼–1¾ in. long, densely-flowered, sometimes sparingly branched at the base; rachis pubescent. Flowers minute, deep yellow. British Central Africa. (J. Bush.)

Populus Andrewsii. (*Sargent, T. & S.* ii. 212.) Salicaceae. H. A natural hybrid between *P. acuminata* and *P. Sargentii.* (E. H. Andrews, Boulder, Colorado, U.S.A.)

Primula Bowlesii. (*J. R. H. S.* xxxix. 227; *G. C.* 1913, liv. 231.) Primulaceae. H. Natural hybrid between *P. pedemontana* and *P. viscosa.* Little Mont Cenis. (R. Farrer; E. A. Bowles.)

Primula conspersa. (*G. C.* 1913, liii. 390, 427.) H. Allied to *P. sibirica*, differing in having finely but variably serrate leaves and rather more rosy flowers. Leaves about 1½ in. long, ½ in. broad, erect, firm in texture, not farinose. Peduncle 9 in. high, farinose. Umbel about 12-flowered. Flowers about ¾ in. across. West Kansu, China. (J. Veitch & Sons.)

***Primula farinosa Beesii.** (*Bees, Cat.* No. 41, 1913, 10.) H. Much larger in all its parts than the type. Flowers bright rose-pink. Western China. (Bees, Ltd.)

***Primula malacoides plena.** (*G. C.* 1913, liv. 408, f. 148.) G. Flowers double, usually bright lilac, but varying considerably in shade of colour. (Bees, Ltd.)

Primula malacoides × obconica. (*R. H.* 1913. 391.) G. Garden hybrid. (Richard Diener & Co., Mountain View, California.)

***Primula pseudodenticulata.** (*G. C.* 1913, liii. 264, f. 113.) H. Very similar to *P. denticulata*, and apparently the Chinese form of that species, differing in having larger leaves and flower-heads. It has been distributed as *P. farinosa* var *Beesii.* Plant 6–12 in. high, with stiff leaves about 4 in. long. Upper half of scape farinose. Flowers in a compact head, fragrant, rosy lilac, with an orange-coloured eye. Yunnan, China. (Bees, Ltd.)

***Primula pulchella.** (*G. M.* 1913, 962, f.) H. Plant 6–12 in. high. Leaves narrowly lanceolate, 2-4¾ in. long, coated on the under side with a golden farina which is also present on the long calyx segments. Umbel many-flowered. Corolla violet, pale purple or lilac, up to ¾ in. long: limb about ¾ in. across. Yunnan, China. (Bees, Ltd.)

***Primula Purdomii.** (*G. C.* 1913, liii. 192, f. 91.) H. Leaves lanceolate, 3–5 in. long, ½–¾ in. broad, tapering to the petiole, covered, as well as

the stem and calyces, with a white meal. Peduncles about 6 in. high. Flowers 1 in. across, 3–12 together in more or less pendulous umbels, lilac-mauve, with a small greenish-yellow eye. Corolla-tube almost closed. West China. (J. Veitch & Sons.)

***Primula secundiflora.** (*Bees, Cat.* No. 41, 1913, 12, f.) H. A vigorous-growing species resembling *P. sikkimensis* in habit. Umbels several-flowered, on scapes much longer than the leaves. Flowers pendulous, rather large, fragrant, dull rich purple. Western China. (Bees, Ltd.)

Primula Silva-Taroucana. (*Fedde, Repert.* xii. 390.) H. Garden hybrid between *P. pulverulenta* and *P. Cockburniana.* (J. Veitch & Sons; Dendrologische Gesellschaft in Oeterreich-Ungarn.) [Syn. *P. Unique;* G. C. 1907, xli. 390, f. 163.]

Primula tangutica var. **sulphurea.** (*G. C.* 1913, liii. 256.) H. Differs from the typical form in having greenish-yellow flowers with a longer calyx and large broad spreading, not recurved, corolla-lobes. West Kansu, China. (J. Veitch & Sons.)

Primula Tewfikiana. (*R. H.* 1913, 367; *G. C.* 1913, liv. 159.) H. Garden hybrid. One of the parents is supposed to be *P. Bulleyana.* The other is unknown. (Vilmorin-Andrieux & Co., Paris.)

Pringlea antiscorbutica. (*R. H.* 1913, 14, ff. 3-4.) Cruciferae. H. "Kerguelen's Land Cabbage," valuable for its antiscorbutic properties. It is a perennial with a long stout rhizome, and forms a head of leaves in which it resembles *Brassica oleracea.* Leaves broadly obovate-spathulate, 3–6 in. long. Peduncle arising from the rhizome, beneath the foliage, 2–3 ft. long, leafy, bearing a dense raceme 6–12 in. long. Sepals oblong. Petals none. Fruits shortly oblong or oblong-lanceolate, ¾–1 in. long. Kerguelen Land. (Paris B. G.)

Prunus glandulosa var. **trichostyla.** (*G. C.* 1913, liii. 192.) Rosaceae. H. A dwarf shrub, with wiry erect growths, apparently quite glabrous; young twigs glossy purple-brown. Leaves appearing with the flowers, about 1 in. long and ⅓ in. broad, finely serrate. Flowers white, about ¾ in. across, solitary, or sometimes in pairs, in the axils of the previous year's leaves. Pedicels ½ in. long. Central China. (Miss Willmott.)

Prunus Pissardii Spaethiana. (*G. C.* 1913, liv. 326.) H. Superior to typical *P. Pissardii* in its shining and deeply-coloured foliage. The colour is retained through the summer and autumn. This plant appeared in cultivation about 3 years ago under the name of Wood's variety. (W. Wood & Son.) [*Prunus cerasifera* var. *atropurpurea* forma.]

Prunus thibetica. (*Veitch, N. H. P.* 1913, 12.) H. A very ornamental species belonging to the section *Euprunus,* attaining a height of 15–20 ft. Flowers blush-pink. Western China. (J. Veitch & Sons.)

Pseudotsuga Douglasii Moerheimii. (*M. D. G.* 1913, 321.) Coniferae. H. A fine form with a compact habit and finer deeper blue foliage than in the type. (B. Ruijs, Moerheim, Dedemsvaart, Holland.)

***Pteridophyllum racemosum.** (*G. C.* 1913, liii. 409.) Papaveraceae. A small glabrous herb. Leaves radical, narrowly obovate, pinnatisect, 4–6 in. long, about 1 in. broad; segments oblong-linear, rounded at the apex. Scape slender, 6–9 in. long, bearing a loose raceme of small white flowers. Japan. (Edinburgh B. G.)

Pteris tremula var. **Duvali.** (*R. H.* 1913, 147; *J. H. F.* 1913, 99.) Filices. G. A sporeling from *P. tremula* with a more elegant habit, fronds of the clearest green and crimped. (C. Le Coulteux, Chesnay, Versailles.)

Pyracantha crenulata var. **yunnanensis.** (*R. H.* 1913, 204, col. t. f. B.) Rosaceae. H. Differs from the type in being more vigorous, in having longer spines, equally persistent larger leaves, corymbs of more numerous small white flowers which have shorter pedicels, and fruits of a much brighter coral red. Yunnan, China. (M. L. de Vilmorin, Les Barres, France.) [Syn. *Crataegus crenulata,* Roxb. var.]

Quercus rubra magnifica. (*M. D. G.* 1913, 322, f.) Cupuliferae. H. A form in which the leaves of one of the lowest branches are 2 or 3 times as large as the ordinary ones. (H. G. von Carlowitz-Hartitzsch, Heyda, Saxony.)

***Raphiolepis indica × Delacouri.** (*R. H.* 1913, 343.) Rosaceae. G. Three unnamed forms of a hybrid with this parentage are described. having respectively red, salmon-rose. and white flowers. (P. Nabonnand, Golfe Juan, France.)

Rhipsalis rosea. (*M. K.* 1913, 156.) Cactaceae. G. A shrubby non-climbing species, up to 10 in. high. Branches 2–4 together, pendulous; lower joints 3–5-angled with somewhat concave sides, up to ¾ in. long; upper joints spathulate, up to 1½ in. long, with somewhat convex sides, not winged, about ½ in. broad at the apex. Flowers solitary, fragrant. Perianth rotate, 1½ in. across, rose. See *Svensk Botanisk Tidskrift*, vi. 717, t. 28. Brazil. (Stockholm B. G.)

***Rhododendron argyrophyllum.** (*Pl. Wils.* i. 526; *Veitch, N. H. P.* 1913, 12.) Ericaceae. H. Very variable in habit. Leaves lanceolate, dark green above, silvery grey beneath. Western China. (J. Veitch & Sons.)

***Rhododendron calophytum.** (*Pl. Wils.* i. 544; *Veitch, N. H. P.* 1913, 12.) H. A strong-growing species, 6–20 ft. high, or often forming a tree. Bark cinnamon-red, passing to pale brown with age. Leaves large, oblong - lanceolate. Inflorescences large, loose. Pedicels long, deep scarlet. Flowers rose-pink. Western China. (J. Veitch & Sons.)

***Rhododendron coreanum.** (*M. D. G.* 1913, 259.) H. Allied to *R. ledifolium*, but the leaves are less hairy, the pedicels and calyx are not glandular-hairy, the calyx-lobes are ovate-oblong or oblong and obtuse instead of being lanceolate and acute, and the purple-lilac corolla, spotted on the upper part with purple-brown, is smaller (about 1¾ in. long and 2 in. across). Corea. (Arnold Arboretum.)

***Rhododendron Davidii.** (*G. C.* 1913, liii., 192.) H. A handsome species, much branched, flowering freely when only 18 in. high. Leaves 4 in. long, 1 in. broad, somewhat shining above, slightly ferruginous below. Inflorescences up to 12-flowered, flat, with the flowers more or less in a ring. Corolla campanulate, bright rose, deeper in colour on the outside. Western China. (J. Veitch & Sons.)

***Rhododendron Davidsonianum.** (*Pl. Wils.* i. 515.) H. A new species allied to *R. chartophyllum*, from which it differs in its usually broader leaves, densely clothed on the under side by tawny scales, shorter pedicels (only 5–7½ lin. long), and smaller flowers. These are campanulate-funnel-shaped, 1–1¼ in. long and broad, rose-coloured, and are 5-lobed to the middle. Western China. (Kew.)

Rhododendron edinense. See *R. pallidum*.

***Rhododendron emasculum.** (*G. C.* 1913, liii. 230.) H. A new name proposed for a plant which has been in gardens for some years as *R. dahuricum sempervirens*. It is believed to be a hybrid of which *R. dahuricum* is probably one of the parents.

***Rhododendron haematocheilum.** (*G. C.* 1913, liii. 214; *B. M.* t. 8518.) A new species which has recently appeared in cultivation under the name of *R. Davidii*. It is closely allied to *R. Fargesii*, from which it may be distinguished by the glabrous ovary. Leaves oblong, rounded or obtuse, apiculate, rounded or subcordate at the base, about 3 in. long and 1¼ in. broad, glabrous. Pedicels ¼–⅔ in. long, sparingly hairy. Calyx very short. Corolla in bud almost blood-red, rich carmine when expanded; tube 1 in. long, 1¼ in. across at the apex; limb 7-lobed. China. (J. Veitch & Sons.) [*R. oreodoxa*, Franchet.]

***Rhododendron Hanceanum.** (*Pl. Wils.* i. 517; *M. D. G.* 1913, 269.) H. A dwarf dense-growing species. Leaves obovate to lanceolate or lanceolate-ovate, shining to dull green above, densely or sparsely lepidote, reddish when young. Flowers clear yellow. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Rhododendron Hunnewellianum. (*Pl. Wils.* i. 535; *M. D. G.* 1913, 269.) H. Shrub 6½–16 ft. high. Branches at first covered by a grey floccose tomentum, finally glabrescent. Leaves coriaceous, oblanceolate, 3–4½ in. long, up to 1 in. broad, glabrous above, slightly wrinkled when mature, covered beneath by a whitish woolly tomentum. Flowers several, in an umbel-like raceme, medium-sized, white. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Rhododendron hypoglaucum.** (*G. C.* 1913, liii. 192.) H. Leaves dull green, elliptic, acute, slightly cordate at the base, 2–3 in. long, ¾–1 in. broad. Inflorescences about 10-flowered. Corolla snow-white, with a small crimson blotch over the gland at the base of the tube, rather broadly campanulate; segments notched. Central China. (J. Veitch & Sons.)

***Rhododendron longesquamatum.** (*Pl. Wils.* i. 529; *M. D. G.* 1913, 269.) H. A very striking and rather variable species. It is very compact in

habit, with brown-felted young branches. Leaves narrowly elliptic to lanceolate, coriaceous, dark green, densely covered with a brown woolly tomentum when young. Flowers medium-sized, rose-pink. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Rhododendron longistylum.** (*Pl. Wils.* i. 514; *M. D. G.* 1913, 269.) H. A pretty species allied to *R. micranthum*, but the small oblanceolate or oblong-lanceolate leaves are less lepidote, and the numerous whitish flowers, arranged in an umbellate raceme, are larger and differently shaped. It is remarkable for the great length of its pistil. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Rhododendron lutescens.** (*J. H. F.* 1913, 162.) H. Shrub about 3 ft. high, with slender branches. Leaves persistent, ovate-lanceolate, acuminate. Flowers in the axils of the upper leaves. Corolla 2–2½ in. across, very open, beautiful clear yellow with some greenish-yellow spots towards the base of the uppermost lobe. Stamens 10; filaments pilose at the base. Western China. (Arnold Arboretum; M. L. de Vilmorin, Les Barres, France.)

***Rhododendron moupinense.** (*Pl. Wils.* i. 525; *M. D. G.* 1913, 269.) H. A dwarf shrub with short hairy young branches. Leaves small, ovate to elliptic, thick, dark green, hairy when young. Flowers white, medium-sized. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Rhododendron nigropunctatum.** (*B. M.* t. 8529.) H. Closely allied to *R. intricatum*, which, on its first appearance in cultivation, was supposed to be *R. nigropunctatum*. It has a similar very dwarf habit, small leaves and flowers, but the latter are solitary or in pairs, the calyx-lobes are longer, and the stamens and style more exserted. Szechuan, China. (J. Veitch & Sons.)

Rhododendron oreodoxa. See *R. haematocheilum*.

***Rhododendron pachytrichum.** (*Pl. Wils.* i. 530; *M. D. G.* 1913, 269.) H. A compact-growing shrub. Branches long, covered when young with brown woolly hairs. Leaves narrow, deep green; petiole hairy. Flowers white. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Rhododendron pallidum.** (*G. C.* 1913, liii. 230, 264, 332, 343.) H. Possibly a hybrid between *R. virgatum* and *R. hirsutum*. It has been in cultivation for several years under the name of *R. virgatum album*. [= *R. edinense*; G. C. 1913, liii. 264; not *R. edinense* of G. C. 1892, xii. 762, which is a hybrid between *R. Nuttallii* and *R. Henryanum*.]

***Rhododendron polylepis.** (*Pl. Wils.* i. 521; *M. D. G.* 1913, 269.) H. This is an earlier name for the species included in the 1910 list as *R. Harrovianum*.

***Rhododendron Ririei.** (*Veitch, N. H. P.* 1913, 12.) H. A distinct species. Leaves oblong-lanceolate, deep green above, grey beneath. Flowers white, about 10, borne in short racemes. Western China. (J. Veitch & Sons.)

***Rhododendron Searsiae.** (*Pl. Wils.* i. 522, *M. D. G.* 1913, 269.) H. Shrub growing to 27 ft high. Leaves oblanceolate or oblong-lanceolate, 1¾–3⅓ in. long, ½–1 in. broad, finally glabrous above, glaucescent and sprinkled with brown scales beneath. Flowers 4–8 in an umbel, 1–1¼ in. long, 1¼–1¾ in. across, white or pale purple. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Rhododendron yanthinum.** (*Pl. Wils.* i. 519; *M. D. G.* 1913, 269.) H. An earlier name for the species included in the 1907 list as *R. Benthamianum*.

Rhodospatha Forgetii. (*K. B.* 1913, 358.) Araceae. S. Stem climbing. Leaves spreading; blade oblong-lanceolate, 16–20 in. long; petiole about 12 in. long. Peduncle 6 in. long. Spathe broadly elliptic, 6 in. long, dirty pale rose-white outside, dirty rose inside. Costa Rica. (F. Sander & Sons.)

Rhynchostylis retusa alba. (*O. W.* iii. 74, f.) Orchidaceae. S. Flowers entirely white. (G. H. Müller-Abeken, The Hague, Holland.)

Ritaia himalaica. (*O. R.* 1913, 175.) Orchidaceae. G. Stems somewhat branched. Leaves lanceolate. Flowers axillary and solitary, inconspicuous, under ¼ in. across, whitish-green, with purple margins to the petals and a yellow swollen apex to the lip. Himalaya. (Kew.)

Robinia Hartwigii. (*M. D. G.* 1913, 1.) Leguminosae. H. Possibly a hybrid

between *R. hispida* and *R. viscosa*. It is distinct in having the shoots so densely leafy and the rachis of the leaves densely clothed with stalked glands. **Racemes densely flowered**, about **3** in. long, including the short peduncle. Flowers about ¾ in. long, purple-rose and whitish. Origin unknown. (W. von Goertzke, Gross-Beuthen, Kr. Teltow, Germany.)

***Rosa persetosa.** (*K. B.* 1913, 263.) Rosaceae. H. A new species of the section *Cinnamomeae* and allied to *R. acicularis*, from which it differs in having smaller flowers arranged in lax panicles. The flowers are deep rose and are 1 in. across. China. (Paul & Son.)

***Rosa sertata.** (*B. M.* t. 8473; *G. C.* 1913, liv. 166, f. 63.) H. A new species differing from *R. Webbiana* in its laxer habit, in having a few straight slender stipulary thorns and a more slender beaked fruit. From *R. Willmottae* it differs in being much larger in all its parts. Leaves 1¾–4 in. long, 7–11-foliolate; leaflets elliptic or elliptic-oblong. Flowers showy, rose or rose-purple, 2–2¼ in. across. Fruits ovoid, narrowed at the top, deep red, about 3 in. long, crowned by the persistent sepals. China. (J. Veitch & Sons.)

***Rosa setipoda.** (*Veitch, N. H. P.* 1913, 5.) H. A robust species, growing to a height of 7–10 ft. Flowers single, silvery pink, shaded rose, produced in clusters of 9–16. Western China. (J. Veitch & Sons.)

***Rosa stellata.** (*G. M.* 1913, 74.) H. Young stems furnished with stellate trichomes. Leaves mostly trifoliate; leaflets more or less truncate and sharply toothed at the apex, cuneiform at the base. Flowers large and showy, deep rose-purple. Fruits large, bearing strong slender prickles; walls not fleshy, but corky; orifice ⅓ in. across. Southern New Mexico. (T. D. A. Cockerell, Boulder, Colorado, U.S.A.; A. R. Wallace.)

Rudbeckia purpurea tubiflora. (*Jard.* 1913, 22.) Compositae. H. Flowerheads large, with long tubular brilliant dark purple florets. (M. Gauguin, Orleans.)

***Ruellia Harveyana.** (*B. M.* t. 8485.) Acanthaceae. S. A new species allied to *R. lactea*. It is a perennial herb, with slender trailing or ascending stems. Leaves petiolate, oblong or elliptic-oblong, 2–3 in. long, 1–1¼ in. broad, softly pubescent. Flowers axillary, sessile, produced one at a time. Corolla pale lilac, with white throat and tube, narrowly cylindric below, broader above, about 1½ in. long; lobes elliptic-rounded, subequal, ⅔–¾ in. long. Mexico. (Kew.)

Saccolabium glomeratum. (*K. B.* 1913, 342; *G. C.* 1913, liv. 317, f. 116.) Orchidaceae. S. Stems trailing, often 1–3 ft. long. Leaves distichous, lanceolate, nearly 4 in. long, about ½ in. broad at the base. Racemes axillary, densely many-flowered, about 1 in. long, pubescent. Flowers small, yellow, spotted with brownish-red on the sepals and petals, and striped with a similar colour on the side lobes of the lip. Borneo. (Hon. N. C. Rothschild.)

***Salix Bockii.** (*K. B.* 1913, 167.) Salicaceae. H. An ornamental dwarf species, densely branched and very leafy. Leaves oblong or oval, ¼–½ in. long, mucronate, dark green and glabrescent above, silvery with silky appressed hairs beneath. Catkins 1–2 in. long, produced in October and November before the fall of the leaves. Bracts narrowly lanceolate, obtuse. Male flowers of 2 stamens. **Filaments united by the whole or nearly the whole of their length.** China. (Arnold Arboretum.)

***Salix Medemii** var. **longifrons.** (*Gfl.* 1913, 242.) H. Differs from the type in having very long narrow leaves. Persia. (Jena B. G.)

Salix zygostemon. (*Gfl.* 1913, 242.) H. Probably a natural hybrid between *S. purpurea* and *S. Medemii*. The form in cultivation, distinguished as f. *melanoclada*, has a dark-coloured bark, while the typical form (*xanthoclada*) has a yellow bark. The densely villous male catkins are 1½ in. long, and the female catkins, also densely villous, are 1½–2½ in. long. Persia. (Jena B. G.)

***Sansevieria conspicua.** (*K. B.* 1913, 306.) Liliaceae. S. A stemless herb. Leaves 3–5, lanceolate, 9–24 in. long, green on both sides, with dark lines above and rusty-brown margins. Inflorescence racemose, 18–20 in. high. Flowers 2 or 3 together in fascicles, white. Perianth-tube 1½–1¾ in. long; lobes linear, 1–1¼ in. long. British East Africa. (Kew.)

Saponaria ocymoides versicolor. (*R. H.* 1913, 302, f. 109.) Caryophyllaceae. H. A form in which the flowers are at first pure white, afterwards passing to rose. It originated by crossing a white-flowering variety and *S. ocymoides splendens*. (Ph. L. de Vilmorin, Verrières-le-Buisson, France.)

Sargentodoxa cuneata. (*Pl. Wils.* i. 351.) Berberidaceae. H. A climbing shrub, up to 23 ft. high. Leaves deciduous, 3-foliolate, glabrous; leaflets rhomboid, rhomboid-obovate, or obliquely ovate, 3–5 in. long or more; petiole 1¾–4½ in. long. Male flowers yellow, fragrant, in pendulous many-flowered racemes. Sepals 6, narrowly oblong, 5–6 lin. long. Female flowers unknown. Syn. *Holboellia cuneata*, Oliver. Central China. (Arnold Arboretum.)

Sarracenia Brucei. (*G. C.* 1913, liii. 357; *G. M.* 1913, 394.)* Sarraceniaceae. G. Similar in form to *S. Arkwrightii.* Pitchers trumpet-shaped, not ventricose, nearly 2 ft. long, deep crimson when young, later veined in the upper half with crimson; lid spreading horizontally, large, white, heavily veined with crimson, shaded with green in the centre, richly frilled on the margin. Flowers green, with the reverse of the sepals shaded crimson. (A. J. A. Bruce.)

Sarracenia Diesneriana. (*O. G. Z.* 1913, 43, f. 18.) G. Garden hybrid between *S. Courtii* and *S. flava.* (Schönbrunn Hofgarten.)

Sarracenia Laschkei. (*O. G. Z.* 1913, 43, f. 18.) G. Garden hybrid between *S. Courtii* and *S. Mooreana.* (Schönbrunn Hofgarten.)

Sarracenia schoenbrunnensis. (*O. G. Z.* 1913, 43.) G. Garden hybrid between *S. Courtii* and *S. Cookeana.* (Schönbrunn Hofgarten.)

Sarracenia Umlauftiana. (*O. G. Z.* 1913, 43.) G. Garden hybrid between *S. Courtii* and *S. Wrigleyana.* (Schönbrunn Hofgarten.)

Sarracenia Vetteriana. (*O. G. Z.* 1913, 43.) G. Garden hybrid between *S. illustrata* and *S. Stevensii.* (Schönbrunn Hofgarten.)

Sarracenia Vogeliana. (*O. G. Z.* 1913, 42 f. 18.) G. Garden hybrid between *S. Courtii* and *S. Stevensii.* (Schönbrunn Hofgarten.)

Saxifraga decipiens bristoleana. (*G. C.* 1913, liii. 224.) Saxifragaceae. H. Flowers bright crimson. (T. Kitley.)

Saxifraga Grandfieldii. (*G. C.* 1913, liii. 357; *G. M.* 1913, 304.) H. A hybrid of unrecorded parentage. Leaves in basal rosettes, encrusted, ligulate, 1 in. long, ¼ in. broad. Peduncle 15 in. long, bearing a spreading inflorescence of pure white flowers. (Sir E. Hambro.)

Scabiosa caucasica magnifica. (*G. C.* 1913, liv. 162; *G. M.* 1913, 674, f.) Dipsaceae. H. Flower-heads darker in colour than in the typical form, saucer-shaped, frilled at the margin, with the outer florets very evenly overlapping one another. (Cocker & Co.)

Schizandra rubriflora. (*Pl. Wils.* i. 412; *M. D. G.* 1913, 269.) Magnoliaceae. H. A strong-growing climbing shrub, reaching a height of 20 ft. Leaves rather large, oblong-ovate to narrowly elliptic, deep green, reddish on the margin; petiole red, about ¾ in. long. Flowers axillary, solitary, red-brown, ¾–1¼ in. across. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Schizandra sphenanthera.** (*Pl. Wils.* i. 414; *M. D. G.* 1913, 270.) H. A climbing shrub, 9–16 ft. high. Branches slender, reddish-brown. Leaves broadly obovate or broadly elliptic, minutely toothed or rarely entire, 2½–4 in. long, 1¼–3 in. broad; petiole ¾ in long, red. Flowers axillary, solitary, greenish-yellow, up to about ¾ in. across. Central and Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Schombo-laelia tibibrosa. (*O. W.* iii. 275.) Orchidaceae. S. Garden hybrid between *Schomburgkia tibicinis* and *Laelia tenebrosa.* (Charlesworth & Co.)

Schombo-laelio-cattleya schoenbrunnensis. (*O. G. Z.* 1913, 92.) Orchidaceae. S. Garden hybrid between *Schomburgkia rosea* and *Laeliocattleya Lucia.* (Schönbrunn Hofgarten.)

***Schomburgkia Wallisii.** (*O. R.* 1913, 154.) Orchidaceae. S. Very much like *S. Lueddemannii* in habit, but the lip is different in structure and colour; it has broad obtuse side lobes and a very acute front lobe, and all the lobes are brown at the apex. Colombia. (Kew.)

Senecio dictyoneurus. (*Bees, Cat.* No. 41, 1913, 15.) Compositae. H. Leaves mostly radical, petiolate, broadly ovate or suborbicular, 4–10 in. long, 3–7 in. broad, glaucous, distinctly veined with yellow. Stems 1½–2 ft. high. Flower-heads somewhat resembling those of *S. pulcher*, but the colour is rich yellow. Western China. (Bees, Ltd.)

Senecio Kirkii. (*B. M.* t. 8524.) H. (?) An erect shrub, 7–15 ft. high. Leaves linear-oblanceolate or

obovate, toothed or entire, 1½–4½ in. long, ½–1¼ in. broad. Corymbs 4–12 in. or sometimes as much as 3 ft. across. Flower-heads 1½–2 in. across, each with about 10 spreading ray-florets. New Zealand. (T. A. Dorrien-Smith.)

***Senecio stenocephalus.** (*B. M.* t. 8472.) H. Closely related to *S. Ligularia*, of which it has been regarded as a variety, but it may be distinguished by the narrower bracts and the fewer flower-heads, which are 1⅓ in. across and have 1–5 bright yellow ray-florets. The variety *comosus* was introduced in 1881. Japan and Northern China. (J. Veitch & Sons.)

Sibiraea laevigata var. **angustata.** (*Pl. Wils.* i. 455.) Rosaceae. H. Differs from the type (*Spiraea laevigata*, L.) in the narrower leaves and shortly pubescent inflorescence. Western China. (Arnold Arboretum.)

Sigmatostalix bicornuta. (*K. B.* 1913, 342.) Orchidaceae. S. Resembles *S. graminea* in habit, but it differs in having a much broader lip, and the petals are furnished at the base with a short conical tooth. Flowers small, yellow, with a deep purple-red stripe on the dorsal sepal and petals. Peru. (F. Sander & Sons.)

***Silene rosiflora.** (*N. B. G. Edinb.* viii. 111.) Caryophyllaceae. H. A perennial herb, 6–12 in. high. Leaves scarcely petiolate, lanceolate, up to 1 in. long and 5 lin. broad. Inflorescence terminal, lax, about 3 in. long, densely glandular-pubescent. Corolla rose, about ¾ in. long. Yunnan, China. (Bees, Ltd.; Edinburgh B. G.)

Sobralia schoenbrunnensis. (*O. G. Z.* 1913, 92.) Orchidaceae. S. Garden hybrid between *S. xantholeuca* var. *superba* and *S. macrantha*. (Schönbrunn Hofgarten.)

Solanum Capsicastrum Melvinii. (*G. C.* 1913, liii. 101, f. 50.) Solanaceae. G. A free-growing variety with narrower leaves than in the type, and slightly smaller conical acute berries, borne in clusters of 3 or 4. (T. E. Grey & Co., Boston, U.S.A.)

***Solenostemon Codefroyae.** (*B. M.* t. 8511.) Labiatae. S. A new species which has been in cultivation since 1903 under the name of *Coleus Godefroyae*. It is a herb, up to 2 ft. high. Leaves very broadly ovate or deltoid ovate, ¾–1¼ in. long, ¾–1¾ in. broad; petiole ½–1¼ in. long. Racemes terminal, spiciform, 6–7 in. long. Corolla ⅓ in. long, blue. Congo and Angola. (F. Sander & Sons, Kew.)

Sophro-cattleya schoenbrunnensis. (*O. G. Z.* 1913, 92.) Orchidaceae. G. Garden hybrid between *Cattleya Bowringiana* and *Sophronitis cernua*. (Schönbrunn Hofgarten.)

***Sorbaria arborea** var. **glabrata.** (*Pl. Wils.* i. 48; *R. H.* 1913, 118.) Rosaceae. H. "Differs from the type chiefly in its glabrous foliage." Central and Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

Spartium junceum ochroleucum. (*M. D. G.* 1913, 214.) Leguminosae. H. A form with whitish flowers. Italy. (C. Sprenger, Naples.)

***Spathoglottis edinensis.** (*G. M.* 1913, 970.) Orchidaceae. S. Garden hybrid between *S. Fortunei* and *S. pulchra*. (Edinburgh B. G.)

***Spiraea arborea** var. **grandis.** (*G. C.* 1913, liv. 94; *G. M.* 1913, 601, 603, f.) Rosaceae. H. Leaflets in about 9 pairs, lanceolate, about 4 in. long and 1 in. broad. Inflorescences very large (18 in. long and 15–18 in. broad at the base), conical. Flowers densely crowded, small, creamy white. Central China. (Hon. Vicary Gibbs.) [*Sorbaria arborea*, C. K. Schneider, var. *grandis*.]

Spiraea calcicola. (*N. B. G. Edinb.* viii. 131.) H. A new species resembling *S. arcuata* in habit, and remarkable for its long slender curved branches with very small obovate usually entire leaves. Inflorescence very narrow, about 5 in. long, consisting of 12–15 fascicles, each of which includes 6–8 flowers. Flowers white, deep rose outside. Yunnan, China. (Bees, Ltd.)

Spiraea digitata nana. (*Bees, Cat.* No. 41, 1913, 20, f.) H. Plant only about 9 in. high. Flowers soft rose-pink. (Bees, Ltd.)

Spiraea Miyabei glabrata. (*Pl. Wils.* i. 454; *Lemoine Cat.* 1913-14, No. 185, 7.) H. A bush 3–6 ft. high. Leaves ovate to ovate-oblong, cuneate at the base, up to 2½ in. long, clear green. Flowers white, in compact glabrous corymbs. Central China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

Spiraea myrtilloides. (*Pl. Wils.* i. 440; *Lemoine Cat.* 1913-14, No. 185, 7.) H. A graceful species resembling *S. alpina*. It is a much-branched shrub, 6–10 ft. high, with divaricate branches. Leaves oval, oval-oblong, or obovate-oblong, entire, 3–5 lin. long, 1½–3 lin. broad. Inflorescence umbellate-racemose, many-flowered, dense. Flowers white, about ¼ in. across. Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

Spiraea Rosthornii. (*Pl. Wils.* i. 451; *Lemoine Cat.* 1913-14, No. 185, 7.) H. Shrub, 3–6½ ft. high. Leaves triangular, 2 in. long, strongly toothed. Flowers in corymbs. Possibly only a pubescent variety of *S. longigemmis*. Western China. Arnold Arboretum; V. Lemoine & Son, Nancy.)

Spiraea Sargentiana. (*G. C.* 1913, liii. 426; *G. M.* 1913, 473.) H. A shrubby free-flowering species forming an irregularly rounded bush about 3 ft. high. Leaves round to lanceolate, usually about ½ in. long, 2- or 3-toothed at the obtuse apex, thin, pale green, slightly tomentose beneath. Corymbs 1–3 in. across, densely flowered. Flowers creamy white, scarcely more than ¼ in. across. Western China. (Hon. Vicary Gibbs.)

Stanhopea grandiflora. (*O. R.* 1912, 172; *B. M.* t. 8517.) Orchidaceae. S. This is *S. grandiflora*, Rchb. f., a species allied to *S. oculata*, but distinguished by the broader, not gradually attenuated, hypochile of the lip. *S. grandiflora*, Lindl., is a different plant, now regarded as a form of *S. eburnea*. Ecuador. (Sir Frank Crisp.)

***Stapelia longipedicellata.** (*K. B.* 1913, 303.) Asclepiadaceae. G. Stems crowded, erect, 4–6 in. long, 4-angled; angles toothed. Cymes pedunculate, 2–4-flowered. Corolla 1½–1¾ in. across, deeply 5-lobed; tube small, purplish; lobes spreading, lanceolate, about ¾ in. long, blackish. Syn. *S. kwebensis* var. *longipedicellata*, Berger. German South-west Africa. (Haage & Schmidt, Erfurt; Kew.)

***Statice Suworowii alba.** (*G. C.* 1913, liii. 426; *G. M.* 913, 473, 477, f.) Plumbaginaceae. H. A form with white flowers. (R. C. Notcutt.)

***Stelis barbata.** (*K. B.* 1913, 141.) Orchidaceae. S. A new species differing from *S. Endresii* in having long-bearded sepals and a tridenticulate lip. Its flowers are only 1½ lin. across, ochreous green, with purple hairs and red-purple blotches. Costa Rica. (Kew.)

***Streptocarpus cyaneus.** (*B. M.* t. 8521.) Gesneraceae. G. Most nearly allied to *S. Rexii*, but the scape is always 2-flowered, and the corolla, which has a much shorter tube, is different in colour, varying from pale lavender or blue to rose-pink or rosy mauve, with a few streaks of red on the 3 lower lobes and a blotch of yellow in the throat. Transvaal. (W. E. Ledger; Kew.)

***Streptocarpus orientalis.** (*G. C.* 1913, liii. 214; *B. M.* t. 8526.) G. Herb with a solitary erect simple stem 6–16 in. high. Leaves opposite, membranous, usually ovate or elliptic-ovate, toothed, 1–3½ in. long, ¾–2¾ in. broad, glandular-pilose. Inflorescence axillary, several-flowered. Corolla purple outside, paler within; tube rather more than 1 in. long; limb about ¾ in. across. The only Asiatic species known. Siam. (Kew.)

***Strongylodon pseudolucidus.** (*B. M.* t. 8494.) Leguminosae. G. A climbing shrub with flowers resembling those of some Erythrinas. Leaves 3-foliolate, nearly 5 in. long; leaflets more or less ovate, 3½ in. long, 2–2¼ in. broad. Racemes axillary, up to 3 in. long. Flowers bright red, about 1 in. long. Madagascar, Ceylon, North Australia, &c. (Charlesworth & Co.)

Styrax dasyanthus. (*Pl. Wils.* i. 289; *M. D. G.* 1913, 272.) Styracaceae. H. A bush or small tree, with slender but firm yellowish-green young branches. Leaves sessile, elliptic, acuminate, toothed, shining yellowish-green. Flowers pure white, fragrant. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Syringa Komarowii.** (*Pl. Wils.* i. 301; *Lemoine Cat.* 1913-14, No. 185, 7.) Oleaceae. H. Grows to 6½ ft. high or more. Branches brown, lenticillate. Leaves broad, crimped, coriaceous. Flowers bright rose-mauve or reddish-purple. Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

***Syringa Wilsonii.** (*Pl. Wils.* i. 300; *R. H.* 1913, 118; *Lemoine Cat.* 1913-14, No. 185, 41.) H. A new species belonging to the section *Villosae*. Shrub 6–23 ft. high. Branchlets glabrous. Leaves membranous, elliptic-lanceolate or elliptic-ovate, 2½–5 in. long, 1–2¼ in. broad, acuminate; petiole about 5 lin. long. In-

florescences terminal, up to 6 in. long. Flowers white or lilac. Corolla-tube 4–5 lin. long; lobes oblong, 2–2½ lin. long, finally spreading or reflexed. Western China. (Arnold Arboretum; V. Lemoine & Son, Nancy.)

***Tanacetum adenanthum.** (*N. B. G. Edinb.* v. 187; *Bees, Cat.* No. 41, 1913, 16.) Compositae. H. Plant densely tufted, 6–12 in. high, strongly aromatic. Leaves finely divided, 5–8 lin. long, clothed with white silky hairs. Flower-heads bright orange-yellow, about ¼ in. across, in loose corymbs. Western China. (Bees, Ltd.)

Tanacetum quercifolium. (*N. B. G. Edinb.* viii. 119.) H. A very distinct new species, with leaves resembling in form those of the English Oak, and a large conspicuous inflorescence. Lower leaves 4–6 in. long. Flower-heads about 2 lin. long and 1½ lin. broad, containing about 20 yellow florets. Yunnan, China. (Edinburgh B. G.)

Thalictrum Purdomii. (*K. B.* 1913, 39.) Ranunculaceae. H. A new species very closely allied to *T. minor*, but the pedicels are slenderer and longer, the flowers larger, and the sepals acute or acuminate. Sepals greenish, ovate-lanceolate, 2½ lin. long. North China. (J. Veitch & Sons.)

***Thunbergia Gibsonii.** (*G. C.* 1913, liii. 333; *Gard.* 1913, 272, 406.) Acanthaceae. G. Stems prostrate. Leaves triangular, about 1 in. long, firm in texture, glossy above. Peduncles axillary, erect, purplish, 3 in. long. Flowers solitary, clear yellow, about 1¼ in. across, each with a pair of inflated and united crimson-stained bracts. British East Africa. (W. Van de Weyer.)

***Thymus Herba-barona.** (*G. M.* 1913, 82.) Labiatae. H. Remarkable in having an odour resembling that of caraway seed. It has a spreading habit, with twiggy branches somewhat more erect than those of *T. Chamaedrys*. Corsica.

***Thymus odoratissimus.** (*G. M.* 1913, 82.) H. One of the handsomest species of the genus. It has a powerful fragrance, a spreading habit with prostrate-ascending stems, and long inflorescences of pale purple flowers. South Russia. (Mrs. W. H. Stansfield.)

***Tilia tonsura.** (*Veitch, N. H. P.* 1913, 15.) Tiliaceae. H. A small tree, with a neat habit and small cuspidate bright green pubescent leaves, serrate on the margin. China. (J. Veitch & Sons.)

Trichocentrum panamense. (*K. B.* 1913, 341.) Orchidaceae. S. A new species anomalous in the shape of its spur, which is very short, dilated, and divided at the apex into 4 short lobes. Flowers light green, with a white lip, bearing a red-purple blotch at the base, and a yellowish spur. Sepals and petals about 1 in. long. Lip ½ in. long. Panama. (Mrs. Lipscomb.)

Trichostema Purpusi. (*M. G. Z.* 1913, 158, ff.) Labiatae. G. A somewhat woody much-branched free-flowering perennial, 1⅓–1¾ ft. high. Leaves shortly petiolate, ovate, ¾–1¼ in. long, 5–7½ lin. broad, dark green. Cymes axillary, pedunculate, few-flowered, forming terminal loose leafy panicles. Corolla showy, scarlet, shortly hairy, about ¾ in. long; upper lip helmet-shaped, 3-lobed; lower lip pendulous. Stamens much exserted. South-west Mexico. (M. Herb, Naples.)

***Tricyrtis stolonifera.** (*G. C.* 1913, liv. 261, 278; *G. M.* 1913, 781.) Liliaceae. H.H. Flowers and foliage somewhat similar to those of *T. hirta*, but the inflorescence is more spreading and is 5 ft. high. Flowers purplish, with darker spots, furnished at the base with 3 double-pouched nectaries. Formosa. (H. J. Elwes.)

Tritoma gracilis. See *Kniphofia gracilis.*

Tropaeolum pinnatum f. **bimaculata.** (*Gfl.* 1913, 281.) Geraniaceae. G. A form in which the 2 upper petals bear a dark blood-red blotch. The petioles and peduncles are also red. The yellow-flowered form of the hybrid is distinguished as f. *lutea*. (Berlin-Dahlem B. G.)

***Tsuga chinensis.** (*Veitch, N. H. P.* 1913, 15.) Coniferae. H. "A fine conifer distinguished by its spreading branches, entire linear leaves, and large subglobose cones." Central and Western China. (J. Veitch & Sons.)

Veronica spicata rosea. (*Bees, Cat.* No. 41, 1913, 20.) Scrophulariaceae. H. A form with rose-coloured flowers. (Bees, Ltd.)

Viburnum acerifolium var. **glabrescens.** (*M. D. G.* 1913, 263.) Capri-

foliaceae. H. Leaves glabrous except for the hairs on the nerves and in the axils of the nerves. North Carolina.

***Viburnum dasyanthum.** (*Sargent, T. & S.* ii. 103, t. 149; *M. D. G.* 1913, 272.) H. A shrub about 8 ft. high. Leaves membranous, ovate or elliptic to oblong, long-acuminate, 2½–5 in. long, 1–2½ in. broad, remotely denticulate. Corymbs terminal, lax, 3–4 in. across. Corolla campanulate-rotate, densely villous outside, very small. Fruits ovoid, red. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Viburnum Harryanum. (*M. D. G.* 1913, 263; *Veitch N. H. P.* 1913, 15.) H. Allied to *V. fœtidum*, but easily distinguished from other species by the small leaves, which reach only about ½ in. in length and 5 lin. in breadth. Flowers small, white. Fruit black. Western China. (J. Veitch & Sons.)

Viburnum pubescens var. **affine.** (*M. D. G.* 1913, 263.) H. Differs from the type in having the leaves nearly glabrous beneath, with petioles only 2–6 lin. long. Missouri and Iowa. (Arnold Arboretum.)

Viola gracilis minuta. (*J. of H.* 1913, lxvii. 155.) Violaceae. H. A. form remarkable for its diminutive leaves and flowers. (P. S. Hayward.)

Vitis pulchra. (*M. D. G.* 1913, 258.) Ampelidaceae. A new species resembling *V. Coignetiae* and *V. amurensis* in the large leaves and hairiness. It is a handsome plant with simple or more or less 3-lobed coarsely serrate leaves, 7–8 in. long, 9–10 in. broad, villous beneath. When young the shoots are crimson. Later the leaves become a glossy bronze-green, purple beneath, afterwards deep green. China or Japan. (J. Veitch & Sons; Arnold Arboretum.) [Syn. *V. flexuosa major*; J. R. H. S. xxviii. 393.]

***Xylobium ecuadorense.** (*K. B.* 1913. 341.) Orchidaceae. G. A new species allied to *X. foveatum*, from which it is distinguished by its smaller flowers and broader lip with 3 keels. The flowers are uniformly light yellow, with segments 6–7½ lin. long. Ecuador. (Mrs. Lipscomb.)

***Xylobium elatum.** (*K. B.* 1913, 341.) Orchidaceae. G. A new species characterised by its tall habit, the scape being as much as 3 ft. high and the leaves correspondingly large. Flowers dull pale green, heavily marked with brown on the back of the segments, with the very prominent tubercles on the lip dark brown. Sepals and petals 7–9 lin. long. Lip 3-lobed, 6 lin. broad. Peru. (F. Sander & Son.)

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1914.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. Sir David Prain, I.M.S., C.M.G., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A., F.L.S.
Assistant, Second Class - -	*John Aikman.
,, ,, ,, - -	*William Nicholls Winn.
Keeper of Herbarium and Library	Otto Stapf, Ph.D., F.R.S., F.L.S.
Assistant, First Class - - -	George Massee, F.L.S.
,, ,, ,, - - -	Charles Henry Wright, A.L.S.
,, Second Class - -	*Robert Allen Rolfe, A.L.S.
,, ,, ,, - -	*Sidney Alfred Skan.
,, ,, ,, - -	Thomas Archibald Sprague, B.Sc., F.L.S.
,, ,, ,, - -	Arthur Disbrowe Cotton, F.L.S.
,, ,, ,, - -	Elsie Maud Wakefield, F.L.S.
,, ,, ,, - -	Munro Briggs Scott, M.A., B.Sc.
,, ,, ,, - -	*William Bertram Turrill.
,, for Tropical Africa -	*John Hutchinson.
,, for India - - -	William Grant Craib, M.A.
Assistant Keeper, Jodrell Laboratory.	Leonard Alfred Boodle, F.L.S.

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Royal Botanic Gardens, Kew—*continued.*

Keeper of Museums - - -	John Masters Hillier.
Assistant, Second Class - -	*John H. Holland, F.L.S.
" " " - -	*William Dallimore.
Preparer - - - - -	George Badderly.
Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Arboretum - - - - -	*Arthur Osborn.
Greenhouse and Ornamental Department.	*John Coutts.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - - -	*George Dear.

Aberdeen.—University Botanic Garden :—

Professor - - -	J. W. H. Trail, M.A., M.D., F.R.S., F.L.S.

Cambridge.—University Botanical Department :—

Professor - - -	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	C. E. Moss, D.Sc.
Curator, University Museum.	H. H. Thomas, B.A.
Curator of Garden -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - -	Sir Frederick W. Moore, M.A., F.L.S.
Assistant - - -	*C. F. Ball.

Trinity College Botanic Gardens :—

Professor - - -	H. H. Dixon, Sc.D. F.R.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	I. B. Balfour, M.A., M.D., LL.D., Sc.D., F.R.S., F.L.S.
Assistant to Regius Keeper.	W. W. Smith, M.A.
Assistant (Museum) -	H. F. Tagg, F.L.S.
" (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	James Whitton.

Oxford.—University Botanic Garden :—

Professor - - -	SydneyH.Vines, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	*William G. Baker.

AFRICA.

Union of South Africa.—

Pretoria.—Department of Agriculture :—

	Chief, Division of Botany	†I. B. Pole Evans, B.Sc., F.L.S.
	Chief Conservator of Forests.	C. E. Legat, B.Sc.

Cape Town.—National Botanic Garden :—

Director - - - -	H. H. W. Pearson, M.A., Sc.D., F.L.S.
Curator - - - -	*J. W. Mathews.
Gardener - - - -	*A. W. Maynard.

Cape Colony.—

Cape Town.—Professor of Botany, South African College.		H. H. W. Pearson, M.A., Sc.D., F.L.S.
	Curator, Bolus Herbarium.	Mrs. F. Bolus.

Gardens and Public Parks :—

Superintendent - -	*G. H. Ridley.

Grahamstown.—Albany Museum :—

Superintendent of Herbarium.	S. Schönland, Ph.D.

Gardens and Public Parks :—

Curator - - -	E. J. Alexander.
Port Elizabeth - Superintendent -	- John T. Butters.
King Williamstown. Curator -	- - George Lockie.
Graaff-Reinet - „	- - *C. J. Howlett.
Uitenhage - „	- - H. Fairey.

Natal.—

Durban - -	Director, Natal Herbarium.	John Medley Wood, D.Sc., A.L.S.

Municipal Gardens :—

Curator - - -	*James Wylie.

Transvaal.—

Pretoria.—Transvaal Museum :—

Superintendent of Herbarium - -	Mrs. R. Pott.

British East Africa Protectorate.—

Nairobi -	Director of Agriculture.	Hon. A. C. Macdonald.
	Mycologist - -	†W. J. Dowson, M.A.
	Chief of Economic Plant Division.	*Henry Powell.
	Agricultural Instructor, Coast Region.	G. Farmer.
	Conservator of Forests	E. Battiscombe.

Egypt.—

Cairo.—Department of Agriculture :—

Director-General	-	Gerald C. Dudgeon, F.E.S.
Botanist	- - -	B. G. C. Bolland, B.A.
Director of Horticulture.		*T. W. Brown.
Assistant Director	-	*F. G. Walsingham.
,, ,,		*G. S. Crouch.

Gold Coast.—Agricultural Department :—

Director of Agriculture.		W. S. D. Tudhope.
Travelling Instructor		*Alfred E. Evans.
Agriculturist	- -	H G. S. Branch.
Senior Curator	- -	*A. C. Miles.
,, ,,	- -	C. Saunders.
,, ,,	- -	*A. B. Culham.
Curator	- - -	M. D. Reece.
,,	- - -	*T. Hunter.
,,	- - -	*G. H. Eady.
,,	- - -	*E. W. Morse.
Conservator of Forests	-	N. C. McLeod.

Nigeria.—

Southern Provinces.—Agricultural Department :—

Director of Agriculture.		*W. H. Johnson, F.L.S.
Assistant Director	-	A. H. Kirby, B.A.
Mycologist-	- -	†C. O. Farquharson, M.A.
Superintendent of Agriculture.		S. V. Henderson.
,, ,,		*F. Evans, F.L.S.
Assistant Superintendent.		*R. Gill.
,, ,,		A. J. Findlay, M.A., B.Sc.
,, ,,		H. G. Burr, B.Sc.
,, ,,		E. R. Owen.
Curator	- - -	*A. R. Bell.
Conservator of Forests	- -	H. N. Thompson.

Northern Provinces.—Agricultural and Forestry Department :—

Director of Agriculture.	P. H. Lamb.
Assistant Superintendent.	R. Nicol.
,, ,,	K. T. Rae.
,, ,,	R. C. Andrew.
,, ,,	T. Thornton.
,, ,,	†A. Wainwright.
,, ,,	†J. E. T. Hartley.
Assistant Conservator of Forests.	B. E. B. Shaw.

Nyasaland Protectorate.—

Agricultural and Forestry Department :—

Zomba - -	Director of Agriculture.	J. S. J. McCall.
	Agriculturist - -	*E. W. Davy.
	,, - -	T. J. Treffry.
	,, - -	J. Jennings.
	Assistant Agriculturist.	A. P. Cliffe.
	,, ,,	D. M. Archdale.
	Chief Forest Officer -	*J. M. Purves.

Rhodesia.—

Bulawayo.—Rhodes Matopos Park :—

Curator - - -	W. E. Dowsett.

Salisbury.—Department of Agriculture :—

Director - - -	E. A. Nobbs, Ph.D., B.Sc.
Agriculturist and Botanist.	H. G. Mundy, F.L.S.

Sierra Leone.—Agricultural Department :—

Director of Agriculture.	W. Hopkins.
Assistant Director -	D. W. Scotland.
,, -	R. H. Bunting.
Conservator of Forests -	C. E. Lane-Poole.

Soudan.—

Khartoum -	Director of Agriculture and Forests.	Major E. B. Wilkinson.
	Superintendent of Palace Gardens.	*F. S. Sillitoe.
Jebelin - -	Superintendent of Experimental Plantations.	*T. Cartwright.

Uganda.—

Kampala—Agricultural Department :—

	Director of Agriculture.	S. Simpson.
	Botanist - - -	W. Small, M.A., B.Sc.
	District Agricultural Officer.	E. T. Bruce.
	,, ,,	A. R. Morgan.
	,, ,,	L. Hewett.
	,, ,,	R. G. Harper.
	,, ,,	*T. D. Maitland.
	Assistant ,, -	*J. D. Snowden.

Entebbe—Botanical, Forestry and Scientific Department :—

Chief Forestry Officer	W. R. Rutter.
Assistant - - -	*Robert Fyffe.
,, - - -	W. Howells.

Zanzibar - -	Director of Agriculture.	F. C. McClellan, F.L.S.

AUSTRALIA.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Cheel.
	" " -	A. A. Hamilton.
	" " -	W. F. Blakeley.
	University Professor of Botany -	A. Anstruther Lawson, D.Sc., Ph.D., F.L.S.

Technological Museum :—

Curator - - -	R. T. Baker, F.L.S.
Director of Forests - - -	R. D. Hay.

Queensland.—

Brisbane - -	Colonial Botanist -	F. M. Bailey, C.M.G., F.L.S.

Botanic Gardens :—

Director - - -	J. F. Bailey.

Acclimatisation Society's Gardens :—

Secretary - - -	L. G. Corrie, F.L.S.
Manager - - -	R. W. Peters.

Forest Department :—

Director - - -	N. W. Jolly, B.Sc.

Cairns.—Instructor in Tropical Agriculture.		Howard Newport.

Kamerunga State Nursery :—

Manager - - -	C. E. Wood.

Rockhampton -	Superintendent - -	R. Simmons.

South Australia.—

Adelaide.—University Professor of Botany.		T. G. B. Osborn, M.Sc.

Botanic Gardens :—

Director - - -	Maurice Holtze, Ph.D., F.L.S.

Woods and Forests :—

Conservator - -	Walter Gill, F.L.S.

Northern Territory.—

Port Darwin.—Botanic Gardens :—

Curator - - -	*C. E. F. Allen.

Tasmania.—

Hobart - -	Government Botanist	Leonard Rodway
	Chief Forests Officer -	J. C. Penny.

Botanic Gardens :—

Superintendent - -	J. Wardman.

Victoria.—

Melbourne.—Botanic Gardens :—

Curator - - -	J. Cronin.

National Herbarium :—

	Government Botanist and University Professor of Botany.	A. J. Ewart, D.Sc., Ph.D., F.L.S.
Conservator of Forests - - -		H. R. Mackay.

BERMUDA.

Agricultural Department :—
Director - - - - - E. J. Wortley.

CANADA.

Ottawa - -	Director of Government Experimental Farms.	J. H. Grisdale.
	Dominion Horticulturist and Curator of Botanic Garden.	W. T. Macoun.
	Dominion Botanist -	H. T. Güssow.
	Assistant - - -	J. W. Eastham, B.Sc., F.L.S.
	„ - - -	F. Fyles, B.A.
Vancouver -	Provincial Botanist -	J. Davidson, F.L.S.

CEYLON.

Peradeniya.—Department of Agriculture :—

Director of Agriculture - - -	R. N. Lyne, F.L.S.
Botanist and Mycologist - - -	†T. Petch, B.A., B.Sc.
Assistant Botanist and Mycologist -	†G. Bryce, M.A., B.Sc.
Superintendent of Experiments -	——
Superintendent of Botanic Gardens	*H. F. Macmillan, F.L.S.
Curator of Royal Botanic Gardens, Peradeniya.	*T. H. Parsons.
Curator, Hakgala Gardens - -	*J. J. Nock.
Conservator of Forests - - -	T. J. Campbell.

CYPRUS.

Principal Forest Officer - - A. K. Bovill.
Inspector of Agriculture - J. Foumis.

FALKLAND ISLANDS.

Government House Garden :—
Head Gardener - - - - - *A. W. Benton.

FIJI.

Superintendent of Agriculture - - Charles H. Knowles.

Botanic Station :—
Curator - - - - - - *Daniel Yeoward.

HONG KONG.

Botanic and Forestry Department :—
Superintendent - - - - *W. J. Tutcher, F.L.S.
Assistant Superintendent - - - *H. Green.

MALTA.

Inspector of Agriculture - - - Francesco Debono, M.D.
Superintendent of Public Gardens - J. Borg, M.D.

MAURITIUS.

Reduit.—Department of Agriculture :—
Director - - - - F. A. Stockdale M.A., F.L.S.
Assistant Director - - †G. G. Auchinleck, B.Sc.
Agricultural Instructor - *F. Birkinshaw.

Pamplemousses.—Department of Forests :—
Director - - - - - Paul Koenig.

NEW ZEALAND.

Wellington.—Department of Agriculture :—
Biologist - - - - T. W. Kirk.
State Forest Department :—
Chief Forester - - - ——
Colonial Botanic Garden :—
Head Gardener - - - ——

Dunedin - - Superintendent - - *D. Tannock.
Napier - - „ - - W. Barton.
Invercargill - Head Gardener - - ——
Auckland - Ranger - - - William Goldie.
Christchurch - Head Gardener - - — Young.

SEYCHELLES.

Botanic Station :—
Curator - - - - - - P. R. Dupont.

STRAITS SETTLEMENTS.

Straits Settlements.—Botanic Gardens :—
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Assistant Director - *T. F. Chipp, B.Sc., F.L.S.
Assistant Superintendent - *J. W. Anderson.

Federated Malay States.—Forest Department :—

	Conservator - -	A. M. Burn-Murdoch

Kuala Lumpur.—Agricultural Department :—

Director of Agriculture.	†L. Lewton-Brain, B.A., F.L.S.
Chief Agricultural Inspector.	†F. W. South, B.A.
Assistant Inspector -	F. Norris.
,, ,, -	A. G. G. Ellis.
,, ,, -	P. B. Richards.
,, ,, -	†H. W. Jack, B.A., B.Sc.
Agriculturist - -	†F. G. Spring.
Mycologist - -	F. T. Brooks, M.A.
Assistant Mycologist -	†A. Sharples.
,, ,,	†W. N. C. Belgrave, B.A.
Economic Botanist -	†G. E. Coombs, B.Sc.
Assistant Superintendent Government Plantations.	*J. N. Milsum.

Perak (Taiping).—Government Gardens and Plantations :—

Superintendent - -	*W. L. Wood.

Selangor and Negri Sembilan.—

Assistant Superintendent.	*J. Lambourne.

WEST INDIES.

Imperial Department of Agriculture :—

Barbados - -	Commissioner - -	Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.
	Scientific Assistant -	W. R. Dunlop.
	Mycologist and Agricultural Lecturer.	W. Nowell.

Antigua.—Government Chemist and Superintendent of Agriculture, Leeward Islands. — H. A. Tempany, B.Sc., F.I.C., F.C.S.

Botanic Station :—

Curator - - -	*T. Jackson.
Agricultural Assistant	C. A. Gomes.
,, ,,	S. V. Athill.

Barbados.—Department of Agriculture.

Superintendent -	John R. Bovell, I.S.O. F.L.S., F.C.S.
Assistant Superintendent.	——

Dominica.—Botanic Station :—

Curator - -	*Joseph Jones.
Assistant Curator -	G. A. Jones.

Grenada.—Botanic Garden :—

Agricultural Superintendent.	*J. C. Moore.
Agricultural Instructor	——

Montserrat.—Botanic Station :—

Curator - - -	*W. Robson.

St. Kitts-Nevis.—Botanic Station :—

Agricultural Superintendent.	F. R. Shepherd.
Agricultural Instructor, Nevis.	W. I. Howell.

St. Lucia.—Botanic Station :—

Agricultural Superintendent.	*A. J. Brooks, F.L.S., F.C.S..
Assistant Superintendent.	——

St. Vincent.—Botanic Station :—

Agricultural Superintendent.	*W. N. Sands, F.L.S.
Assistant Agricultural Superintendent.	S. C. Harland, B.Sc.

Virgin Islands.—Botanic Station :—

Curator (Acting) -	G. A. Gomes.

Bahamas.—Botanic Station :—

Curator - - -	W. M. Cunningham.

British Guiana.—Department of Science and Agriculture :—

Georgetown -	Director - - -	Prof. J. B. Harrison, C.M.G., M.A., F.I.C., F.C.S.
	Assistant Director and Government Botanist.	†C. K. Bancroft, M.A., F.L.S.
	Forestry Officer -	C. W. Anderson, I.S.O.
	Head Gardener -	*R. Service.
	Assistant Gardener -	F. Greeves.
	Agricultural Superintendent.	*Robert Ward.

British Honduras.—Botanic Station :—

Curator - - -	Eugene Campbell.

Jamaica.—Department of Agriculture :—

Director - - -	Hon. H. H. Cousins, M.A., F.C.S.
Travelling Instructor	*William Cradwick.
„ „	James Briscoe.

Public Gardens and Plantations :—

Superintendent -	*William Harris, F.L.S.
Superintendent of King's House Gardens.	*William J. Thompson.
Superintendent of Experiment Station.	P. W. Murray.

Tobago.—Botanic Station :—

Curator - - - - -	*W. E. Broadway.

Trinidad.—Department of Agriculture :—

Director - - -	Prof. P. Carmody, F.I.C., F.C.S.
Assistant Director and Government Botanist.	W. G. Freeman, F.L.S.
Curator, Royal Botanic Gardens.	J. C. Augustus.
Mycologist - -	J. B. Rorer, M.A.
Forest Officer - - -	C. S. Rogers.

INDIA.

Botanical Survey of India :—

Director - - - - -	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Economic Botanist - - -	†H. G. Carter, M.B., Ch.B.
Assistant for Phanerogamic Botany	M. S. Ramaswami, M.A.
,, ,, ,,	P. M. Debburman, B.Sc.

Departments of Agriculture, Botanical Officers attached to :—

Imperial Agricultural Research Institute, Pusa, Bengal :—

Mycologist - - - -	†E. J. Butler, M.B., F.L.S.
Economic Botanist - -	A. Howard, C.I.E., M.A., F.L.S.
Supernumerary Botanist -	——

Bengal Agricultural Department, Calcutta :—

Economic Botanist - -	E. J. Woodhouse, B.A., F.L.S.

Bombay Agricultural Department, Poona :—

Economic Botanist - -	†W. Burns, B.Sc.

Central Provinces Agricultural Department, Nagpur :—

Economic Botanist - -	†R. J. D. Graham, M.A., B.Sc.

Madras Agricultural Department :—

Government Sugarcane Expert, Agricultural College, Coimbatore.	†C. A. Barber, M.A., Sc.D., F.L.S.
Lecturing Botanist - -	K. Rangachari, M.A.
Mycologist - - - -	†W. McRae, M.A., B.Sc., F.L.S.

Departments of Agriculture, Botanical Officers attached to—*continued.*

Punjab Agricultural Department, Lyallpur :—

Economic Botanist - - †D. Milne, B.Sc.

United Provinces Agricultural Department, Cawnpur :—

Economic Botanist - - †H. M. Leake, M.A., F.L.S.

Eastern Bengal and Assam Agricultural Department :—

Economic Botanist - - P. G. Hector, B.Sc.

BENGAL.

Calcutta.—Royal Botanic Garden, Sibpur :—

Superintendent - - - - Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator of Herbarium - - - †C. C. Calder, B.Sc., F.L.S.
Curator of Garden - - - *G. T. Lane.
1st Overseer - - - - - N. Mitra.
2nd Overseer - - - - - - ——
Probationer - - - - - - ——

Gardens in Calcutta :—

Assistant Curator - - - - *W. V. North.
Overseer - - - - - S. N. Bose.

Agri-Horticultural Society of India :—

Secretary - - - - - F. Abbott.
Asst. Secretary and Superintendent S. P. Lancaster.

Darjeeling.—Lloyd Botanic Garden :—

Superintendent - - - - Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator - - - - - - *G. H. Cave.

Cinchona Department.—

Superintendent of Cinchona Cultivation. Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Mungpoo Plantation :—

Manager - - - - - *P. T. Russell.
1st Overseer - - - - - W. Cousins.
2nd Overseer - - - - - P. Cresswell.

Munsong Plantation :—

Manager - - - - - *H. F. Green.
Assistant Manager - - - - *H. Thomas.
Overseer - - - - - G. Holl.

BOMBAY.

Bombay City.—Municipal Garden :—

Superintendent - - - - C. D. Mahaluxmivala

Ghorpuri.—Botanic Garden :—

Superintendent - - - - P. G. Kanetkar.

Poona.—Government Gardens :—

Superintendent - - - - *E. Little.

CENTRAL PROVINCES.

Nagpur.—Public Gardens :—

Superintendent - - - - *J. E. Leslie.

MADRAS.

Madras City.—Agri-Horticultural Society :—

Hon. Secretary - - - - L. E. Kirwan.
Superintendent - - - - H. E. Houghton, F.L.S.

Ootacamund.—Government Gardens and Parks :—

Curator - - - - - *F. H. Butcher.

Cinchona Department.—

Director of Cinchona Plantations - W. M. Standen.
Superintendent, Dodabetta Plantation. - H. V. Ryan.
Superintendent, Nedivattam and Hooker Plantations. - E. Collins.

PUNJAB.

Delhi.—Government Horticultural Department :—

Officer in Charge - - - - *A. E. P. Griessen.

Historic and other Gardens :—

Superintendent - - - - *R. H. Locke.

Lahore.—Government Gardens :—

Superintendent - - - - *A. Hardie.

Agri-Horticultural Gardens :—

Superintendent - - - - *W. R. Mustoe.

Simla.—Vice-regal Estate Gardens :—

Superintendent - - - *Ernest Long.

NORTH-WEST FRONTIER PROVINCE.

Agri-Horticulturist - - - *W. R. Brown.

UNITED PROVINCES OF AGRA AND OUDH.

Agra.—Taj and other Gardens :—
Superintendent - - - - ——

Allahabad.—Government Gardens :—
Superintendent - - - - *W. Head.

Cawnpur.—Memorial and other Gardens :—
Superintendent - - - - *R. Badgery.

Kumaon.—Government Gardens :—
Superintendent - - - - *Norman Gill, F.L.S

Lucknow.—Horticultural Gardens :—
Superintendent - - - - *H. J. Davies.
Probationer - - - - *E. E. Mawer.

Saharanpur.—Government Botanic Gardens :—
Superintendent - - - - *A. C. Hartless.

Dehra Dun.—Imperial Forest Research Institute :—
Imperial Forest Botanist - - R. S. Hole, F.L.S

EASTERN BENGAL AND ASSAM.

Dacca (Ramna).—Arboricultural Expert. *R. L. Proudlock.

NATIVE STATES.

Mysore (Bangalore) :—
Economic Botanist - - - *G. H. Krumbiegel.

Baroda :—
Superintendent - - - - T. R. Kothawala.

Travancore (Trivandrum) :—
Director - - - - Major F. W. Dawson.

Udaipur :—
Superintendent - - - - T. H. Storey.